WipLL

Wireless IP-Based Local Loop System

Hardware Installation Manual

For

Release 4.2A

Connecting the World with Wireless Access Solutions

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Contents

Part I: Installing WipLL Base Station Equipment

Part II: Installing WipLL Customer Premises Equipment

About this Manual

This section discusses the purpose, targeted audience, references, organization, and technical support of the WipLL Hardware Installation manual.

Purpose

This manual describes the installation procedures of Airspan's **WipLL** system, release 4.0. This installation includes WipLL equipment at the base station and at the subscriber's premises (i.e., CPE equipment).

Although this manual provides minimum software configuration information for certain WipLL units, it is not comprehensive. For detailed software configuration information, see the *WipLL Commissioning Manual*.

Targeted Audience

This manual is intended for the person who is responsible for installing the WipLL system, and who should be familiar with electronic circuitary and wiring.

Organization of this manual

This manual is organized into the following chapters and parts:

■ Chapter 1, "**WipLL System Overview**"—provides a brief overview of the WipLL system.

■ Chapter 2, "**Safety Guidelines**"—lists the safety guidelines for handling cables and electricity during the installation.

■ Chapter 3, "**Unpacking and Required Tools**"—lists the equipment provided by Airspan, as well as the tools needed for installation.

■ Part 1, "**Installing WipLL Base Station Equipment**"—includes the following chapters concerned with installing WipLL equipment at the base station:

  ■ Chapter 4, "**Installing the Base Station Radio**"

  ■ Chapter 5, "**Installing the Base Station Distribution Unit**"

  ■ Chapter 6, "**Installing the GPS"**

  ■ Chapter 7, "**Installing the Base Station Power Supply**"

■ Part 2, "**Installing WipLL Customer Premises Equipment**"—includes the following chapters concerned with installing WipLL equipment at the subscriber's premises:

  ■ Chapter 8, "**Installing the Subscribers Premises Radio**"

  ■ Chapter 8, "**Installing the Subscriber Data Adapter**"

  ■ Chapter 9, "**Installing the Indoor Data Radio**"

■ Appendix A, "**Glossary**"—glossary of terms used in this manual

■ Appendix B, "**Cable Crimping**"—describes the crimping procedure for 15-Pin D-type, N-type, and GPS connectors.

■ Appendix C, "**Technical Specifications**"—lists the technical specifications of the WipLL units.

Technical support

For service and support for your WipLL system, contact your regional Airspan representative, or Airspan's Technical Assistance Center (TAC) at:

■ **Telephone hotline:** (+972)-8-929 2266

■ **E-mail:** Wipll.tech_support@Airspan.com

Introduction

Airspan's **AS WipLL** system (hereafter referred to as WipLL) is a low-cost, high-performance point-to-multipoint IP-based Broadband Fixed Wireless (BFW) Access solution. WipLL provides wireless local-loop (last-mile) connectivity designed to deliver high-speed data, Voice over IP (VoIP), and multimedia services to residential, SOHO (small office/home office), and SME (small medium enterprise). **WipLL** offers service providers an integrated access solution, providing quick-to-market deployment and low-market entry cost for broadband services.

WipLL provides connectivity speeds of up to 4 Mbps in the licensed 2.8 GHz, 3.x GHz, and Multichannel Multipoint Distribution Services (MMDS), and unlicensed 2.4 GHz (ISM) and 5.8 GHz radio frequency bands. In the 5.8 GHz band, the WipLL system supports 3 Mbps and 4 Mbps transmission speeds. For 1, 2, and 3 Mbps, WipLL implements the Frequency Hopping spread spectrum mode; for 4 Mbps, WipLL implements the Hybrid spread spectrum mode. Each **WipLL** base station, at maximum configuration, supports up to 3,024 subscribers.

WipLL enables interconnection with the Public Switched Telephone Network (PSTN) by the use of an IP-to-PSTN gateway. **WipLL** provides VoIP by its interoperability with a wide range of third-party products such as residential gateways (RGW), access gateways, gatekeepers, and softswitches.

WipLL utilizes air protocol technology for wireless packet switching using Frequency Hopping technology. In addition, **WipLL**'s in-house Preemptive Polling Multiple Access (PPMA) air MAC protocol technology, which recognizes transmission type and assigns bandwidth, is highly efficient—80% throughput (e.g., 80% of 4 Mbps = 3.2 Mbps net capacity)—allowing multiple concurrent subscribers to utilize bandwidth.

WipLL provides bandwidth management by supporting Committed Information Rate (CIR) and Maximum Information Rate (MIR), guaranteeing bandwidth levels to subscribers. In addition, **WipLL** supports VLANs/VPNs based on IEEE 802.1Q/p. **WipLL** supports IP routing and PPPoE bridging, as well as transparent bridging, allowing easy IP addressing schemes.

WipLL provides embedded security features such as IP (packet) filters based on addresses, protocols, and applications.

The **WipLL** system provides SNMP-based management, allowing remote and local management, configuration, and monitoring of WipLL equipment.

1.1. Main Features

The WipLL system includes the following main features:

- Low initial investment, maximum return on investment (ROI)

- IP-based air interface supporting high speed data, VoIP, and multimedia services

- Modular architecture with flexible deployment architectures

- 4 Mbps (3.2 Mbps net) per sector—up to 24 sectors per base station

- Compact, integrated design allowing easy and quick deployment

- Advanced Quality of Service (QoS)

- Simultaneous support of IP routing and PPPoE bridging

- Supports Transparent bridging

- Bandwidth management: CIR and MIR

- Supports 802.1Q/p for VLANs/VPNs and end-to-end QoS

- Supports local and remote SNMP-based management, providing an intuitive GUI for easy management

1.2. Customer Benefits

The WipLL system provides the following customer benefits and advantages over competitors:

■ No IF or RF cables required for indoor unit-to-outdoor unit (IDU-to-ODU) connectivity, providing a more cost-effective and easier installation. Instead of IF/RF cables, WipLL implements standard CAT-5 Ethernet cables.

■ Scalability and modular architecture allows customers to add equipment when needed, thereby allowing low initial cost entry and pay-as-you-grow strategy. Unlike competitors, WipLL is not a chassis-based design, providing flexibility and saving space at the base station.

■ WipLL's open architecture allows interoperability with multi-vendor products such as residential gateways (RGW), access gateways, gatekeepers, and softswitches, thereby, operating seamlessly in multi-vendor environments.

■ WipLL's proprietary PPMA air MAC protocol is highly efficient—80% throughput—allowing multiple concurrent subscribers to utilize bandwidth without network degradation (from collisions and high BER).

■ WipLL is both an IP router and a PPPoE bridge.

■ Supports Transparent bridging for easy implementation of IP addressing schemes

■ WipLL's IP routing provides efficiency and eliminates the need for additional hardware.

■ Enhanced QoS—based on IP addresses, protocols, and applications.

■ End-to-end QoS—based on DiffServ/TOS or 802.1p.

■ Embedded security features such as IP (packet) filters based on addresses, protocols, and applications.

■ Rich networking packages such as 802.1Q/p VLANs/VPNs.

■ Long distance radio coverage.

1.3. System Architecture

The WipLL system architecture is composed of the following three basic areas (see Figure 1-1):

■ **Base station site:** consists of WipLL access units that interface between the provider's backbone and the WipLL system.

■ **Subscriber site:** consists of WipLL customer premises equipment (CPE) that interfaces between the base station and the subscriber's network.

■ **Network operations center (NOC):** consists of the WipLL SNMP-based management system that manages the entire WipLL system.
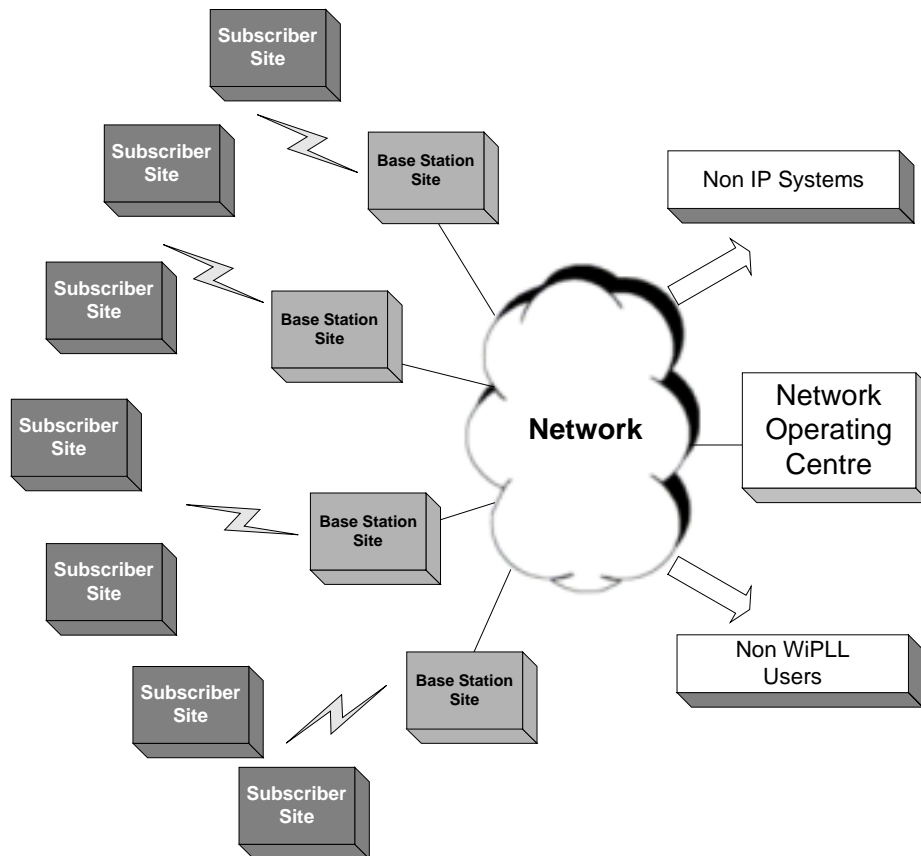
Figure 1-1: WipLL System Architecture

1.3.1. Base Station

The WipLL base station provides a radio link between the subscriber and the service provider's backbone to provide high-speed data access, Internet access, and VoIP. The WipLL base station equipment consists of a radio transceiver that transmits and receives signals to and from the subscriber, and of various optional Ethernet hubs that connect the WipLL transceiver to the service provider's backbone, through a 100BaseT Ethernet connection.

The WipLL base station is comprised of the following units (see Figure 1-3):

■ **Base Station Radio** (BSR)**:**

The BSR is a radio transceiver that provides the wireless link between the subscriber and the provider's backbone. Each BSR has 60-degree radio coverage, serving up to 126 subscribers in that sector.

The BSR is installed outside the base station site, typically mounted on a pole.

■ **Point-to-Point Radio** (PPR):

The PPR device is similar to the BSR, but implemented in a point-to-point radio configuration providing wireless communication with a single remote WipLL radio unit (i.e., Subscriber Premises Radio).
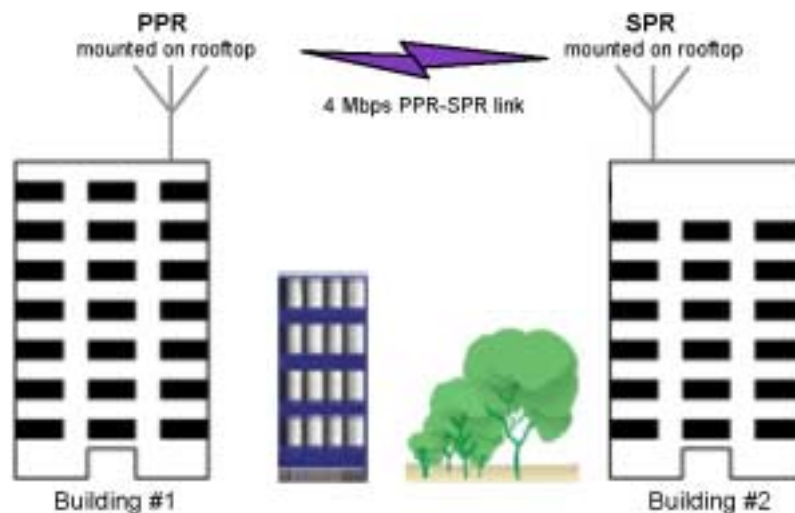
Figure 1-2: PPR in a building-to-building application

■ **Subscriber Data Adapter** (SDA)**:**

The SDA is implemented at base stations comprised of a single BSR. The SDA provides the BSR with -48 VDC power supply and Ethernet connectivity to the provider's backbone. The SDA is installed inside, connected to the BSR with a CAT-5 cable.

■ **Base Station Distribution Unit** (BSDU)**:**

The BSDU is implemented at base stations comprising multiple BSRs. The BSDU provides BSRs with –48 VDC power supply, connectivity to the provider's backbone, and frequency hop synchronization. The BSDU is installed inside, connected to BSRs with CAT-5 cables.

Each BSDU can support up to six BSRs, and up to four BSDUs can be daisy-chained to support a maximum of 24 BSRs. Therefore, a base station at maximum configuration can serve up to 3,024 subscribers.

■ **Base Station Power Supply** (BSPS)**:**

The BSPS is an optional WipLL unit that provides AC-to-DC power conversion and power redundancy to BSDUs.

■ **Global Positioning System (GPS) antenna:**

The GPS antenna is a rugged, self-contained GPS receiver and antenna that receives a universal GPS satellite clock signal. The GPS connects to the BSDU and synchronizes multiple base stations to allow the WipLL network to operate with the same clock, and eliminating radio frequency ghosting effects.

Figure 1-3 shows the WipLL base station devices and their interconnections.
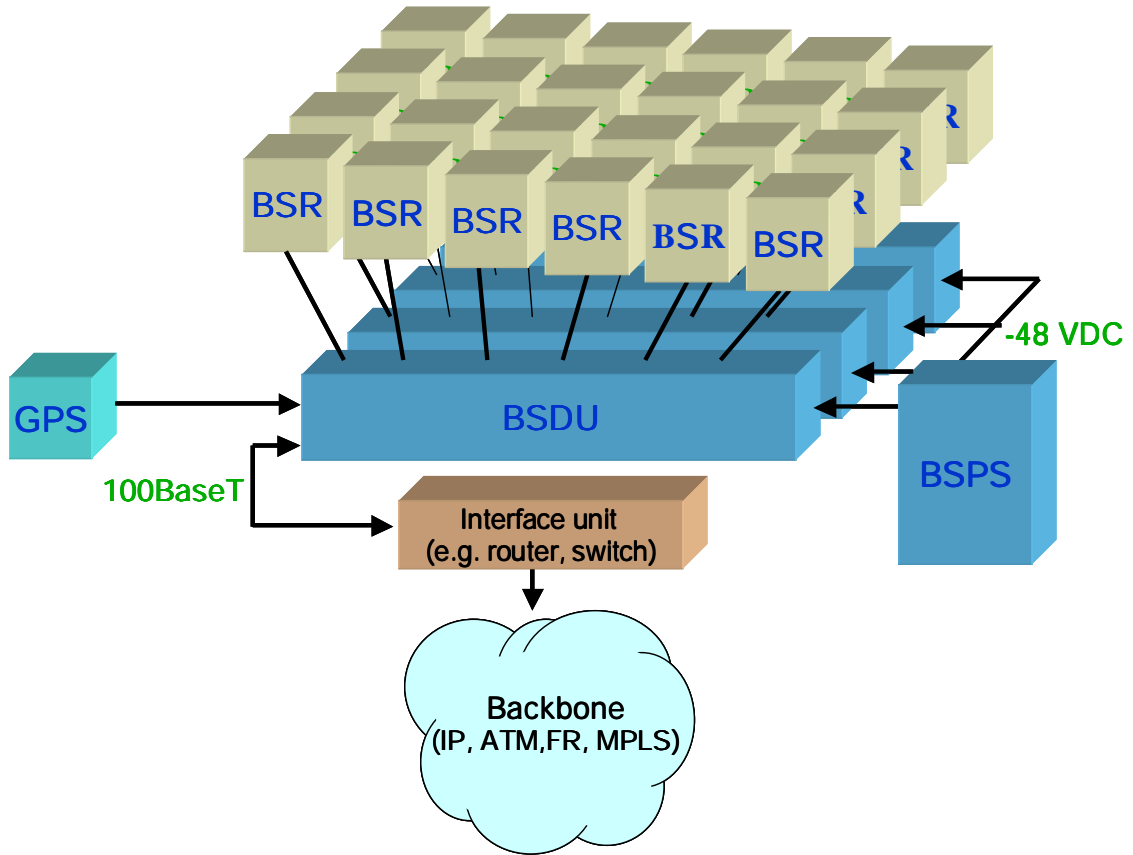
Figure 1-3: WipLL base station units (maximum configuration)

1.3.2. Subscriber Site

The WipLL subscriber site is located at the service provider's subscribers' premises. The WipLL subscriber site equipment consists of a radio transceiver that receives and transmits signals from and to the base station. The WipLL radio transceiver provides the subscriber with high-speed data access, Internet access, and VoIP at up to 3.2 Mbps. The WipLL transceiver connects to the subscriber's network or PC via WipLL's Ethernet hub (i.e., Subscriber Data Adapter).

The WipLL system can group subscribers into VLANs, as well as assign MIR and CIR levels to each subscriber, guaranteeing bandwidth to subscribers.

The WipLL subscriber site is comprised of the following units:

■ **Subscriber Premises Radio** (SPR)**:**

The SPR is a radio transceiver that provides a wireless link between the base station and the subscriber's network. The SPR is installed outside the subscriber's premises, typically on a roof.

■ **Subscriber Data Adapter** (SDA)**:**

The SDA is a hub/switch that provides the SPR with -48 VDC power supply and Ethernet connectivity to the subscriber's network/PC. The SDA is installed inside the subscriber's premises and is connected to the SPR by a CAT-5 cable.

The SDA models include the following:

■ **SDA-1:** provides one 10BaseT connection to the subscriber's computer and/or network.

■ **SDA-4H:** provides a hub and four 10BaseT interfaces to the subscriber's computers and/or networks. The hub interface is a crossed Ethernet cable that can connect to another hub or LAN switch. Alternatively, it may be connected to another PC via a crossed Ethernet cable.

■ **SDA-4S models:** integrated LAN switches, providing four 10/100BaseT ports for interfacing with the subscriber's PCs/network) These models include the following:

– **SDA-4S (standard):** Standard integrated LAN switch, providing four 10/100BaseT interfaces to the subscriber's computers.

– **SDA-4S/VL:** Provides VLANs between its ports and the SPR, ensuring privacy between users of different ports (i.e., multi-tenant VLAN security). For example, all users connected to Port 1 do not "see" users connected to Port 2.

– **SDA-4S/1H3L:** Provides a high priority port (left-most port) for VoIP traffic.

– **SDA-4S/VL/1H3L:** Combines the functionality of the SDA-4S/VL and SDA-4S/1H3L models (VLAN for each port and a high priority port for VoIP).

■ **Indoor Radio Adapter** (IDR)—optional unit**:**

The IDR functions as a transceiver and a hub, eliminating the need for an SPR and SDA. The IDR is installed inside the subscriber's premises, typically mounted on a wall, desktop, or pole. The IDR is connected to a third-party antenna, which is typically mounted outside to provide line-of-site with the base station.

■ **Residential Gateway (RGW)—**optional unit**:**

The RGW is a third-party unit that provides gateway support for VoIP. The RGW is typically connected to the SDA through a 10BaseT port.

Figure 1-4 and Figure 1-5 display the WipLL customer premises equipment and their interconnections.
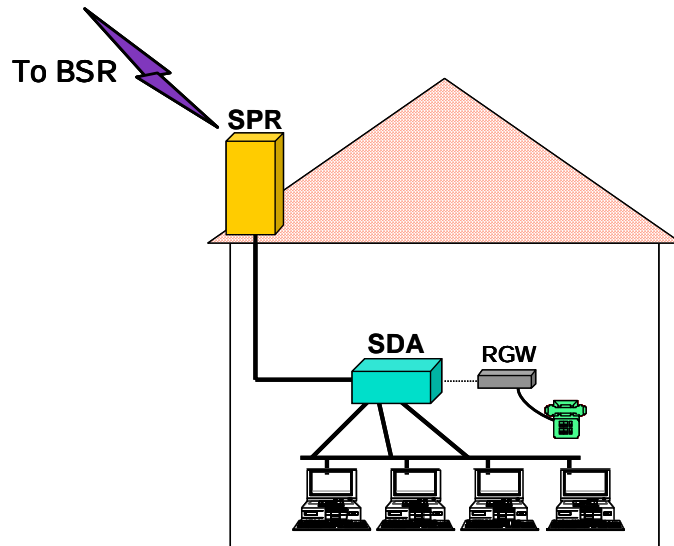
Figure 1-4: Subscriber site with SPR and SDA units (optional RGW unit)
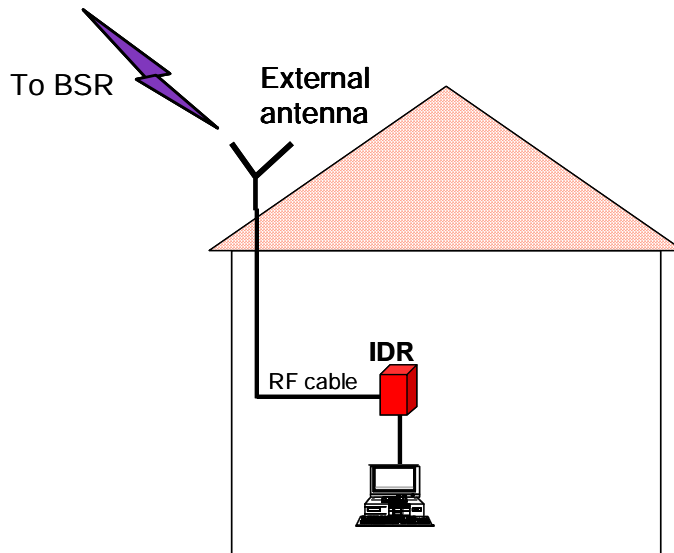
Figure 1-5: Subscriber site with IDR and third-party external antenna

1.3.3. Network Operations Center

Airspan's WipLL system provides state-of-the-art, use-friendly management tools for managing the WipLL system. These management tools provide fault, configuration, performance, and security management of the WipLL system.

The WipLL system provides two management tools:

■ **WipManage**™--WipLL network (and element) management system tool.

WipManage is a Windows-based, stand-alone WipLL application that provides a user-friendly Graphic User Interface (GUI) for managing the WipLL system.

WipManage provides local and remote network management that is based on Simple Network Management Protocol (SNMP). WipManage provides configuration, fault and alarms, security, and bandwidth management to all the WipLL units—WipLL base station equipment and WipLL CPE.

■ **WipConfig**™--WipLL initial configuration tool.

WipConfig is an easy-to-use, Windows-based application that provides local initial configuration to WipLL hardware. This initial configuration includes, for example, assigning the units IP addresses and positioning the antenna (or transceiver) for optimal reception.

1.4. Applications

The following subsections provide examples of typical WipLL applications.

1.4.1. Broadband Data Access

Using a standard PSTN modem in circuit-switched networks, subscribers are limited to 56 Kbps of throughput, and in most cases, to 28.8 Kbps. From the operator's perspective, once a subscriber has dialed up with a PSTN modem, a full 128 Kbps channel is occupied for as long as the session lasts.

WipLL subscribers are limited only by their own configuration, with a maximum of 4 Mbps—50 times faster than the fastest PSTN modem. However, subscribers do not necessarily consume more bandwidth from the operator, since bandwidth is used only when a data packet is transmitted.

These characteristics of WipLL make it suitable for providing data access to subscribers while maintaining best usage of bandwidth and capacity.

1.4.2. High Speed Internet Access

One of the advantages of WipLL is the fact that subscribers are "always on" Internet. This means that there is no dialing process and no need for the hassle involved with dialup access. Subscribers need only to open their Web browser or e-mail to be instantly connected.

WipLL can also distinguish between applications and subscribers, thus, enabling the operator to provide different class of service to subscribers. For example, it can provide different services to Web browsing and e-mail by prioritizing Web browsing for ensuring best "Internet experience".

Figure 1-6 shows a typical WipLL application for high-speed Internet access.
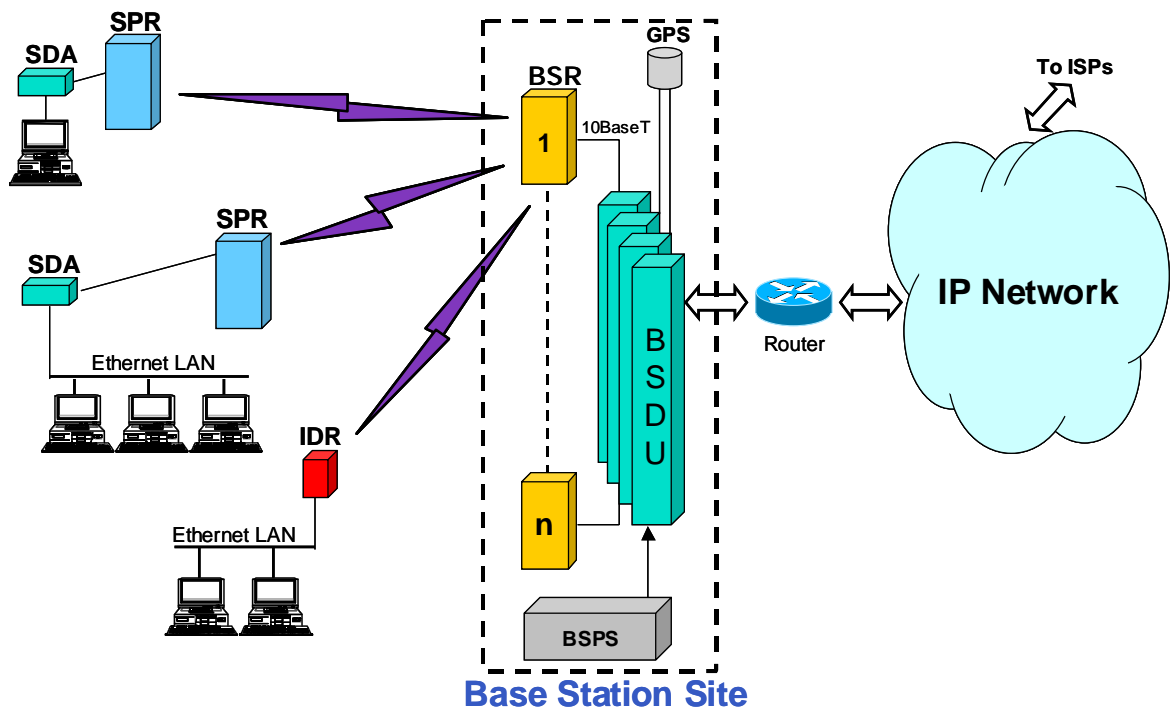
Figure 1-6: Typical WipLL Application for High-Speed Internet Access

1.4.3. Voice over IP

The WipLL system enables customers the flexibility of migration from a data-only network to an integrated Voice-over-IP and data network. The WipLL voice solution provides interoperability with any IP-to-PSTN network gateway. The use of the IP-to-PSTN gateway allows operators seamless PSTN connectivity such as SS7 (signaling network), G3-303, and V5.2 over E1, allowing deployment in multi-national markets.

Figure 1-7 shows a typical WipLL application for VoIP.
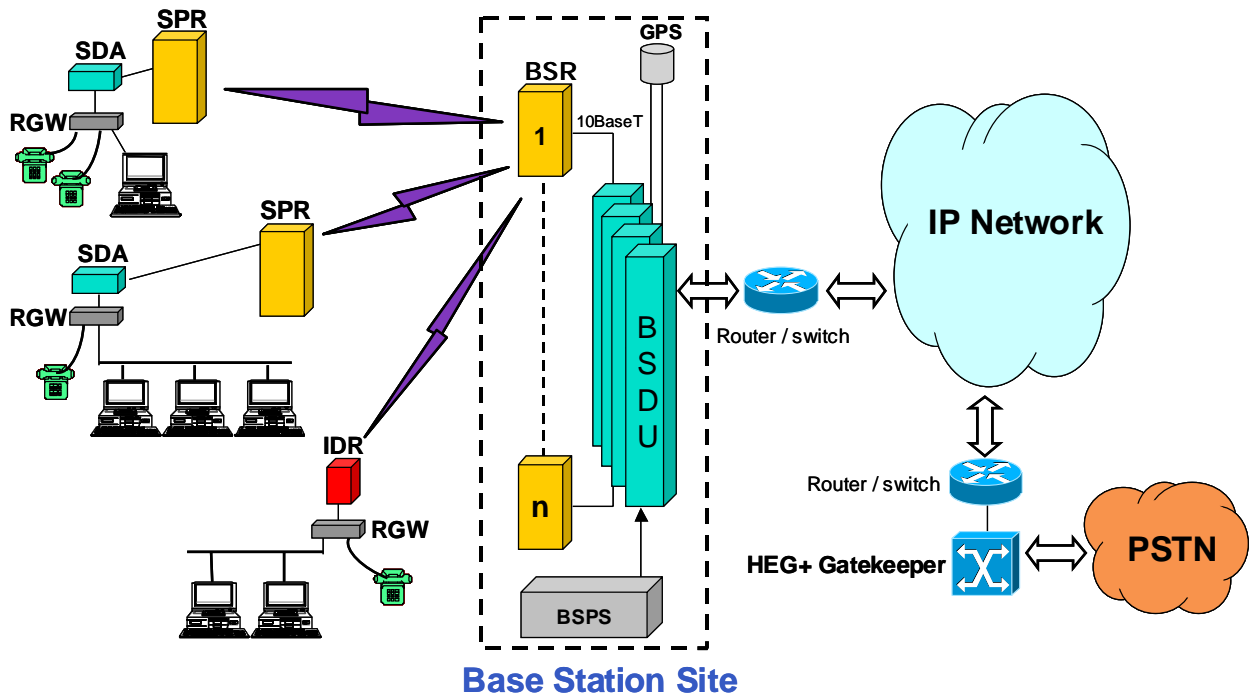
Figure 1-7: Typical WipLL Application for VoIP

1.4.4. Repeater Solution

WipLL units can be used to provide repeater functionality. This is implemented in where the BSR needs to be "extended" to remote subscriber sites that are blocked by obstacles (such as trees, hills, and other typical line-of-sight obstructions) or that the BSR-SPR (or BSR-IDR) transmission is out-of-range. Back-to-back Ethernet connectivity of a BSR with an SPR/IDR provides the repeater capability, as demonstrated in Figure 1-8.
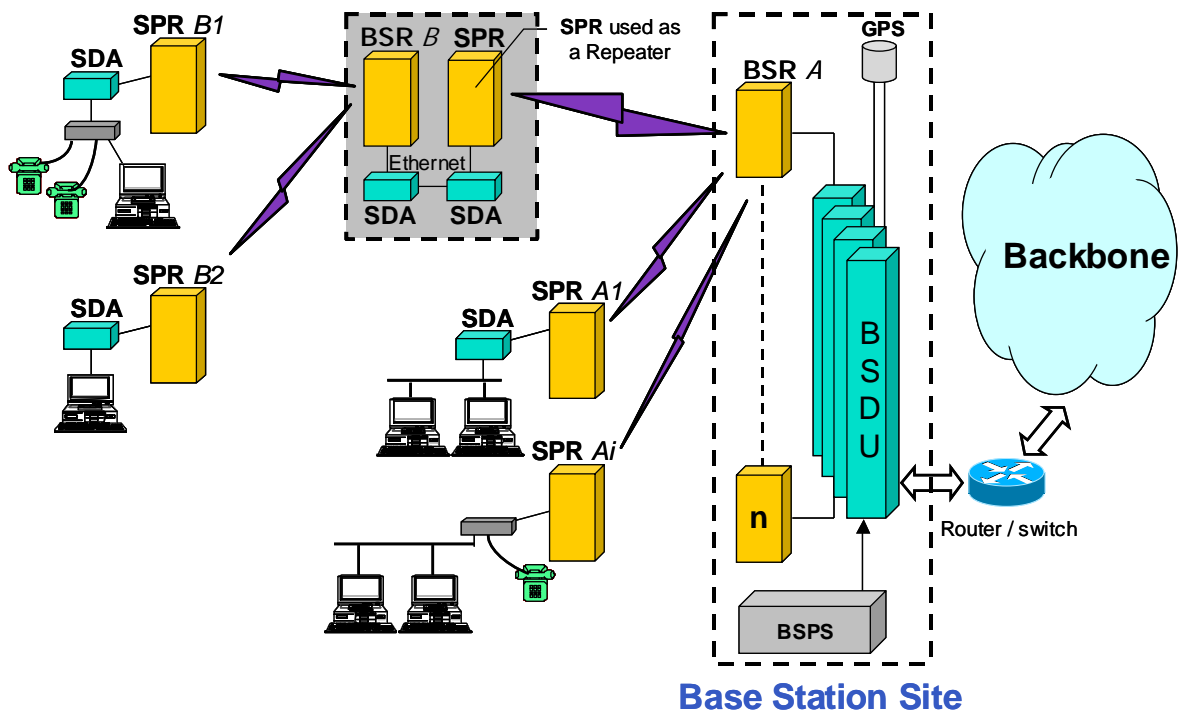
Figure 1-8: WipLL Repeater Solution

In Figure 1-8, BSR *A* is part of a WipLL base station that is connected to the service provider's backbone. BSR *A* serves multiple SPRs, marked as SPR **Ai**. Two SPRs— SPR **B1** and SPR **B2**—cannot communicate directly with the base station. Therefore, an SPR acts as a repeater by connecting back-to-back with BSR *B* (SPR **B1** and **B2** are served by BSR **B**).

Notes:

- Careful planning is required to cope with issues such as interferences and delay that are introduced by the repeater solution. For example, if the system is used as a frequency hopping system, GPS may be required at each base station.

- Space and frequency isolation between the "repeater SPR" and BSR *B* is required.

- Bandwidth management should be calculated to support the "repeater bandwidth".

- IP addressing and routing tables should be configured to support the repeater solution.

Safety Guidelines

This chapter outlines general safety guidelines for electricity handling, preventing radio interference, and cable labeling when installing the WipLL system.

This chapter includes the following sections:

■ General Safety Guidelines

■ Electrical Safety Guidelines

    ■ Handling Electrostatic Devices

    ■ Grounding

■ Lightening Protection

■ Preventing Radio Interference

■ Cabling

    ■ Cable Labeling

        – Voltage Warning Labels

        – High Earth Leakage Current

        – Signal Cable Designation Label

2.1. General Safety Guidelines

The following lists general safety guidelines when working with the WipLL equipment:

■ The user and the installer should be aware that changes and modifications not expressly approved by Airspan Networks could void the user's authority to operate the equipment

■ Never install equipment that is damaged.

■ Only qualified personnel should be allowed to install, replace, and service the WipLL equipment.

2.2. Electrical Safety Guidelines

The following lists electrical safety guidelines when working with the WipLL equipment:

■ Disconnect all power when installing

■ Never install the equipment during stormy weather and lightening

2.2.1. Handling Electrostatic Devices

Electrostatic devices are those devices that may be damaged by the inadvertent discharge of static electricity from a charged body. The risk of damage, due to electrostatic discharge (ESD) to a device, may cause the device to fail suddenly, or it may induce a partial defect within the device, which will cause subsequent premature failure.

Static electricity can result from operators walking on floors, moving around on chairs, from the movement of operator's clothing or even casual brushing against racks, benches or walls.

Airspan recommends the following guidelines to be adopted to minimize the risk of component failure due to electrostatic discharge to the device:

■ WipLL devices are provided typically in see-through anti-static bags. Wherever possible, checking and inspection of a unit should occur without removing it from the bag.

■ All operators shall wear the approved conductive overall.

■ Where operators come into direct contact with any piece of electronic hardware, operators must wear an ESD bonding wrist strap. All straps and cords should be tested using a Wrist Strap Tester prior to use.

All operators shall wear an ESD-preventive wrist strap and cord to a suitable non-mains earth (ESD stud) on the rack. The wrist strap cords shall have a 2 Meg Ohm resistor fitted at either end.   Wrist straps should be worn in direct contact with bare skin and not over clothing.

> **Warning:** Under no circumstances is it permissible for units to be handled by unprotected operators.

2.2.2. Grounding

Only certain WipLL devices are required to have additional grounding. The WipLL devices that do not require additional grounding have grounding at the main supply outlet.

Site	WipLL device	Grounding
Base Station:	BSR	Through the mains (via BSDU)
	BSDU	Additional grounding required (grounding lug at rear end of chassis)
	BSPS	Additional grounding required (grounding lug at rear end of chassis)
CPE	SPR	Through the mains (via SDA)
	IDR	Through the mains

2.3. Lightening Protection

WipLL devices comply to the Surge Immunity standard: EN 61000-4-5.

WipLL devices are protected from lightening surges by the fact that the outdoor devices (BSR and SPR devices) are encased in a plastic chassis. Therefore, if lightening strikes the device, an electrical circuit cannot be completed, and hence, no electrical surge can occur.

In addition, WipLL outdoor and indoor (SDA) devices provide high speed data line protection against direct and induced transient over-voltages surges on the cables. This capability is provided by the fact that all WipLL device are designed with TVS (transient voltage suppressor) components that maintain potential differences.

However, Airspan Networks can supply a surge protector composed of a 15-pin D-type adapter with a grounding wire for geographical areas that have above normal lightening activity.

2.4. Preventing Radio Interference

The digital portion of the transceiver has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try correct the interference by performing one or more of the following measures:

- Reorientate or relocate the receiving antenna

- Increase separation between the equipment and receiver

- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected

- Consult the dealer or an experienced radio/TV technician for help

Warning: The WipLL transceivers emit microwave radiation; a minimum distance of 200 mm must be maintained from the front of the device, and a minimum separation of 1 meter must exists between adjacently installed WipLL transceivers.

2.5. Cabling

This section defines the cabling procedures to be adopted during WipLL equipment installations at both base station and subscriber premises.

Note: Prior to the commencement of any installation, commissioning work at 'live' sites it is the responsibility of the Airspan engineer to advise the customers representative before any activity commences. If in doubt assume equipment is 'live'.

Warning: Disturbance of cables on an In-Service exchange can cause loss of service. Extreme care must be taken when installing cables at any customer or subscriber premises.

A summary of issues to be considered during cabling of WipLL base station and customer premises equipment is as follows:

■ Cable routes are to be defined in the site-specific documentation.

■ Data and DC power cables running parallel to AC power cables shall be separated by a minimum distance of 200 mm. However, it is permissible to allow these cables to cross each other at right angles.

■ Observe recommended minimum bend radii when installing copper cables. Wherever a cable changes direction, ensure that it does so in a smooth curve with a radius of at least 50mm in order to prevent damage.

■ Plastic ties and wraps are to be used to secure cables to trays and guides. Ensure all trimmed ends are disposed of safely and at regular intervals.

■ Data cables of less than 20 pair shall be mixed in bundles not exceeding 50 mm in diameter.

■ Ensure cables are not trapped in cabinet doors, by slide-in equipment or support metalwork.

■ Excessive stress on cable terminations caused by taught cables should be avoided. Connector strain relief, if not built into the connector used, shall be provided by means of a strategically located cable tie.

■ A maintenance loop or a generous amount of cable slack shall be provided to allow for equipment removal without disturbance to adjacent cables.

■ Cables run in guides or on trays shall be kept as flat as possible and secured at regular intervals using cable ties.

2.5.1. Cable Labeling

Warning: Voltages over 30 Volts AC and 50 Volts DC are categorized as hazardous. Hazard warning labels should be fitted where required.

Certain countries require equipment warning and instruction labels to appear in the local language. When installing WipLL equipment ensure that local requirements regarding labels are given consideration.

Labels required to be fitted to WipLL equipment are as follows:

2.5.1.1. Voltage Warning Labels

■ Where mains power is fed from separate phases, then appropriate warning labels must be fitted to warn of the increased danger.

■ The AC equipment used in the BSPS cabinet must carry a relevant voltage warning label specific to the country in which it is being installed. The label will be fitted to the cabinet doors displaying an electrical hazard symbol, the local operating voltage and the letters 'AC'.

■ A power feed identification label (e.g. PWR 'A') shall be applied in the following locations:

   ■ On the rear of the main power rack adjacent to the terminal block

   ■ Attached to BSPS AC mains power plug or lead

   ■ Attached to the customer mains power socket or distribution rail

   ■ On the BSPS power circuit connection at the fuse board

2.5.1.2. High Earth Leakage Current

If equipment earth leakage current exceeds 3.5mA., a warning label (Airspan code 1MAE10377AAY) as shown in Figure 2-1 will be fitted to the rear of the main power rack alongside the AC inlet terminal block.

> **WARNING**
>
> HIGH LEAKAGE CURRENT
> Earth connection essential
> Before connecting supply
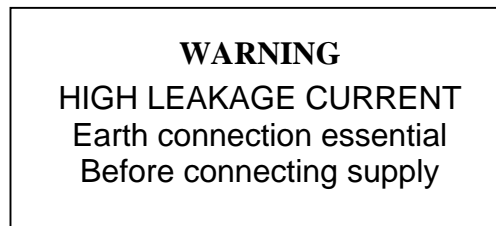
Figure 2-1: Warning label if earth leakage current exceeds 3.5 mA

2.5.1.3. Signal Cable Designation Label

A wrap around identification label, similar to that shown in Figure 2-2, is to be fitted to both ends of WipLL data cables. Care should be taken to ensure that the cable identification information is clearly visible. The labels are to be supplied with the installer's folder. Identify the cable as detailed in the CROL supplied by Contract Engineering. Fit the label 100 mm from the cable end. Wrap the label ensuring good adhesion to cable and itself.

```
From              To
BDSU 1/1          SPR 1
To                From
SPR 1             BDSU 1/1


       BSDU End           SPR End
```
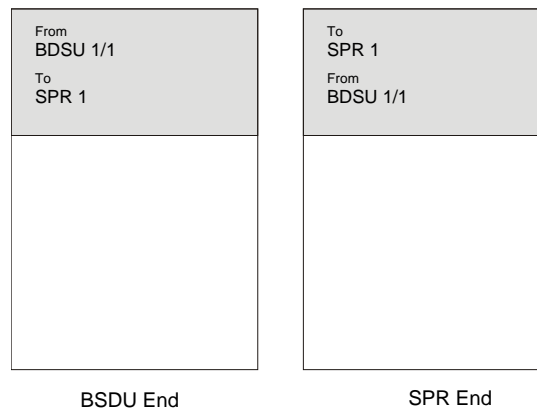
Figure 2-2: Typical signal cable identification label

3

Unpacking and Required Tools

This chapter discusse the following:

■ Unpacking WipLL equipment

■ Required tools

3.1. Unpacking and Verifying Contents

> **Note:** Examine the WipLL shipping container. If you notice any damage, or missing items immediately notify the carrier that delivered the unit and contact the Airspan representative.

The WipLL hardware equipment can be divided into two parts:

■ Base station equipment

■ CPE equipment

3.1.1. Base Station Equipment

Certain base station equipment is required while others are optional equipment, depending on the type of configuration and includes the following:

■ Base Station Radio (BSR)—required

■ Base Station Distribution Unit (BSDU)—optional

■ Base Station Power System (BSPS)—optional

■ GPS antenna—optional

3.1.1.1. BSR

The BSR kit includes the following components:

■ BSR chassis

■ Mounting equipment that includes:

    ■ Mounting brackets

    ■ Mounting screws:

       – Washers

       – 4 x Screws

       – Bolts

■ Connectors:

    ■ 15-Pin D-type (for data and serial interface, and power)

    ■ N-type (optional for third-party external antenna)

Figure 3-1: BSR kit

3.1.1.2. BSDU (optional)

The BSDU interfaces between the BSR and the backhaul network, as well as used for daisy-chaining BSR units. The BSDU kit includes the following connectors:

■ Mounting: four off M5 screws and plastic-cup washers

■ 6 x RJ-45: two each for 100Base-T, 10Base-T, and clock synchronization

■ 2 X 9-Pin D-type (for monitor and management)

■ 7 x 15-Pin D-type (for power, Ethernet, daisy-chaining BSRs, and GPS)

■ Power cable

Figure 3-2: BSDU kit

3.1.1.3. BSPS (optional)

The BSPS is an optional power redundancy unit (DC-UPS). The BSPS includes the following parts:

- Rectifier

- DC Distribution

- System Controller

3.1.1.4. GPS (optional)

The GPS antenna synchronizes base stations by providing a universal satellite clock signal.

- 5,15, or 50 meter mating cable

- 5/8″ adapter

- Magnet mount

Figure 3-3: GPS kit

3.1.2. Customer Premises Equipment

WipLL hardware installed at the customer's site includes the following:

■ Subscriber Premises Radio (SPR)

■ Subscriber Data Adapter (SDA)

■ Indoor Unit (IDR)—optional, instead of the SPR and SDA

3.1.2.1. SPR

The SPR consists of the following parts:

■ SPR chassis

■ Mounting equipment that includes:

    ■ Mounting bracket

    ■ 2 x Screws

    ■ 2 x Bolts

    ■ 4 x Washers

■ 15-Pin D-type connector

Figure 3-4: SPR kit

3.1.2.2. SDA

The SDA is an Ethernet hub that connects to the main power supply and provides data connection to the SPR. The SDA is available in two diffrenet modesl:

■ SDA-1

■ SDA-4H

3.1.2.2.1. SDA-1

The SDA-1 provides one 10Base-T connection to a host PC or network. The SDA-1 includes the following parts:

■ SDA-1 chassis

■ Power cable

Figure 3-5: SDA-1 kit

3.1.2.2.2. SDA-4H

The SDA-4H includes four interfaces: three for PC connection; one for daisy-chaining to another hub or a LAN switch. The SDA-4H includes the following parts:

■ SDA-4H chassis

■ Power cable

Figure 3-6: SDA-4H kit

3.1.2.2.3. SDA-4S

The SDA-4S includes four 10/100Base-T interfaces for PC connection. The SDA-4S kit includes the following parts:

■ SDA-4S chassis

■ Power cable

Figure 3-7: SDA-4S kit TBD

3.1.2.3. IDR kit

The IDR unit is an optional customer premises equioment that replaces the SPR and SDA. The IDR combines the SPR and SDA in one unit.

The IDR is available in two models: IDR with external antenna; IDR with internal antenna. These two IDR models have the same parts, except that the IDR with external antenna model has a connector for attaching a third-party antenna. The IDR unit includes the following parts:

- Chassis

- Power cable

- Power supply unit

- Ethernet cable

- Mounting stand

Figure 3-8: IDR kit

3.2. Required Tools

The following tools are required for installing the WipLL system:

■ Pin crimper tool for CAT-5e cables for 15-Pin D-type and N-type connectors, and for GPS connectros

■ Cable stripping tool

■ Philips screw driver

■ Flat-blade screwdriver

■ Adjustable wrench

■ ESD-prevention wrist strap

■ Torque wrench for N-type connectors

■ IDR unit:

  ■ Flat blade screwdriver

  ■ Pozidriv screwdriver

  ■ 3 mm A/F Allen key

  ■ 10 mm A/F open ended spanner

Part I

Installing WipLL
Base Station Equipment

Part I describes the procedures for installing the WipLL base station equipment, and includes the following chapters:

- Chapter 4, "Installing the Base Station Radio (BSR)"

- Chapter 5, "Installing the Base Station Distribution Unit (BSDU)"

- Chapter 6, "Installing the GPS"

- Chapter 7, "Installing the Base Station Power Supply (BSPS)"

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Installing the BSR

This chapter describes the installation of the WipLL **Base Station Radio** (BSR) that is installed at the base station.

This chapter includes the following sections:

- Overview

- Physical Dimensions

- Cable Installation Guidelines

- Connecting the BSR for Serial Configuration

- Connecting to the Backhaul Network and Power Supply

    - Single BSR at a Base Station

    - Multiple BSRs at a Base Station

- Conecting a Third-Party External Antenna (Optional)

- Mounting the BSR

    - Attaching the Mounting Bracket

    - Orientating the Mounted BSR

    - Mounting the BSR on a Pole

4.1. Overview

The BSR is the center of the WipLL system. The BSR provides last-mile wireless connectivity by connecting the customer's backhaul network to the subscriber's wireless unit (Subscriber Premises Radio [SPR]). In addition, the BSR is responsible for synchronizing the WipLL network (i.e., synchronizing SPRs/IDRs).

For base stations consisting of only a single BSR, the BSR is typically powered and connected to the customer's backhaul by the WipLL Subscriber Data Adapter (SDA). For base stations consisting of multiple BSRs, the BSRs are powered and connected to the customer's backhaul by the WipLL Base Station Distribution Unit (BSDU).

The BSR is available in two models: BSR with an internal antenna providing 60° sector coverage; and a BSR with an N-type port for connection to an optional third-party external antenna.

4.2. Physical Dimensions and Basic Design

The BSR is encased in a chassis providing access to the BSR's communication port at the front panel (see Figure 4-1). The BSR's bottom panel provides holes for mounting the BSR to, for example, a pole or wall (see Figure 4-2).

15-pin D-type port
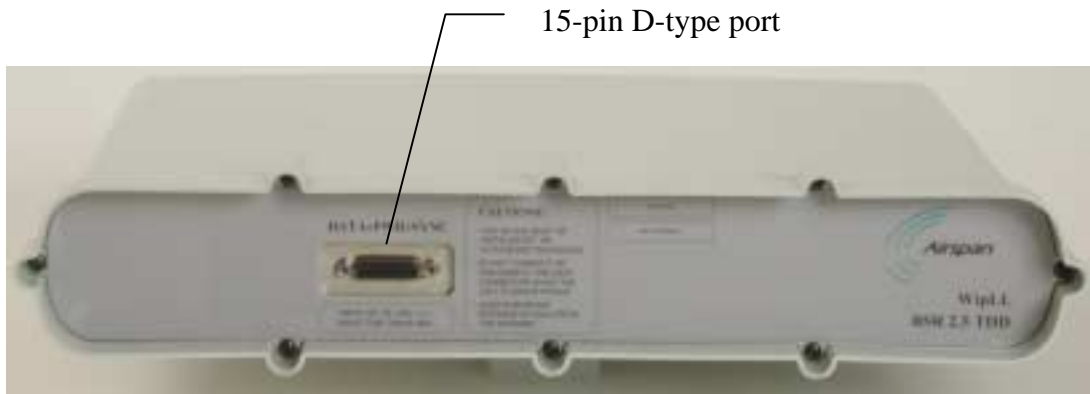
Figure 4-1: BSR front panel (internal antenna model)
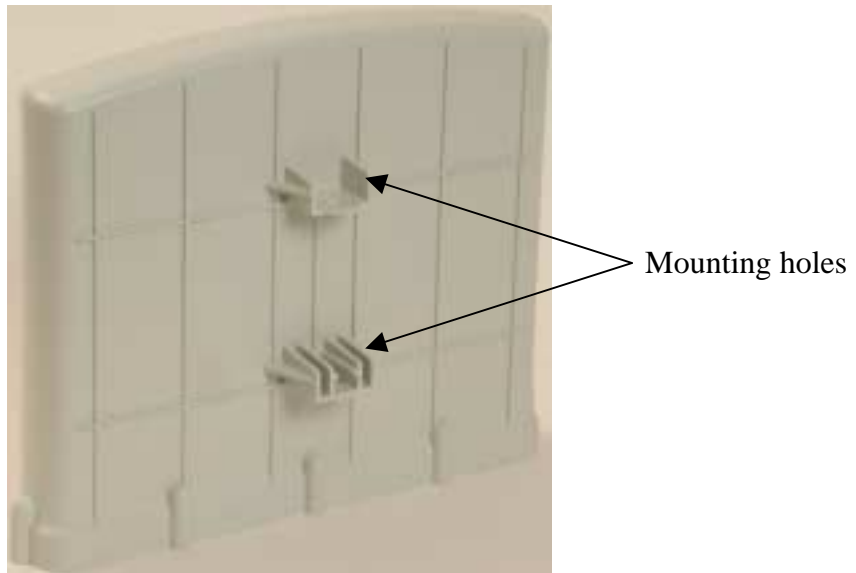
Mounting holes

Figure 4-2: BSR bottom panel providing holes for mounting

The BSR's physical dimensions are described in Table 4-1

<div align="center">

Table 4-1: BSR Physical Dimensions

Parameter	Value
Height	400 mm (15.74 inches)
Width	317 mm (12.48 inches)
Depth	65.5 mm (2.58 inches)
Weight	4.7 kg

</div>

Note: The BSR's physical dimensions exclude the mounting kit.

4.3. Cable Installation Guidelines

This section defines the procedures to be adhered to when installing data cables at the base station.

Warning: Pre-terminated cables should be fitted with protective poly bags during cable installation processes.

Metal cable trays shall be earthed to a central earth point within the customers' equipment room.

Note: A minimum separation of 200 mm should exist between power and data cables.

The following points are to be considered:

■ When installing network cables, ensure that they are not damaged by friction or sharp edges. Spacing of installation personnel at regular distances during any cable drawing-in process will avoid contact with potential hazards.

■ Data cables providing connection to the customers network shall be run in suitable conduit or trunking. Cable trunking should be secured to the wall in accordance with manufacturers instructions.

■ Cables should be carefully fed through trunking and not pulled by means of any attached connector.

■ Sufficient space should be provided in cable ducts, trunking or trays (where possible) to allow for future cabling growth.

■ External data cables are to be protected in protective conduit which is to be secured to the building structure in accordance with manufacturers recommendations. Trunking must not be located as to provide a trip hazard at the base station premises (e.g. roof walkways)

■ BSR cables are to be dressed tidily to the mounting pole or bracket using strategically placed cable ties.

■ Observe recommended minimum bend radii when installing copper cables. Wherever a cable changes direction, ensure that it does so in a smooth curve with a radius of at least 50mm in order to prevent damage.

■ A maintenance loop is to be left in the cable just before the cable reaches the BSR or GPS to prevent strain on the connector.

■ Data cables entering holes drilled in walls are to be dressed to provide a loop that will prevent water ingress into the building along the cable.

■ Silicone sealant should be used to plug any holes on both internal and external wall surfaces once cables are in place.

■ All data cables should be labeled with both the source and destination at each end.

Note: The maximum cable length between the BSR and terminating equipment is 100 meters.

4.4. Connecting the BSR for Serial Configuration

The BSR's 15-pin D-type port provides serial interface to a PC for BSR initial configuration. This port uses 9 of its 15 pins for serial interface; the remaining pins are used for interfacing with the BSDU or SDA with which the BSR is connected. To connect the BSR to the PC and the SDA or BSDU, a Y-cable is used.

> **Note:** For performing BSR initial configuration using WipLL's management applications, refer to *WipConfig User's Guide* and *WipConfig PDA User's Guide.*

The BSR-to-PC management station serial cable connections include the following

■ **Connectors:**

    ■ **BSR:** 15-pin D-type male (only 9-pins used)

    ■ **PC:** 9-pin D-type (RS-232)

    ■ **SDA/BSDU:** 15-pin D-type male

■ **Cable:** straight-through Y-cable
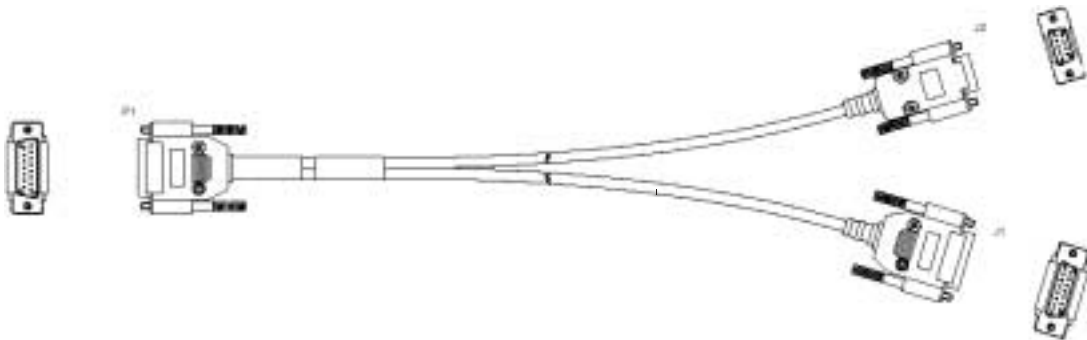
Figure 4-3: Y-Cable (P1 for BSR; J1 for SDA/BSDU; J2 for PC's serial port)

■ **Connector pinouts:** Table 4-2 displays the connector pinouts for the 15-pin D-type connectors at the BSR and SDA/BSDU, and the 9-pin D-type connector at the PC management station.

Table 4-2: Y-cable connector pinouts for BSR serial cable connection

SPR (15-pin D Type) P1		SDA (15-pin D Type) J1		PC (RS-232) J2	
Pin	**Function**	**Pin**		**9-Pin**	**Function**
1	0 VDC	1	0 VDC	1	
2	+48 VDC	2	+48 VDC	2	Tx
3	Ethernet Tx+	3	Ethernet Tx+	3	Rx
4	Ethernet Tx-	4	Ethernet Tx-	4	
5	Ethernet Rx+	5	Ethernet Rx+	5	GND
6	Ethernet Rx-	6	Ethernet Rx-	6	
7	Hop Sync+	7	Hop Sync+	7	
8	Hop Sync-	8	Hop Sync-	8	
9	NC	9	NC	9	
10	NC	10	NC		
11	NC	11	NC		
12	NC	12	NC		
13	NC	13	NC		
14	RS232 Rx	14	NC		
15	RS232 Tx	15	NC		

The Y-cable connector pin assignments is displayed in Figure 4-4.

Figure 4-4: Y-cable connector pin assignment

To connect the BSR to the PC and SDA/BSDU for serial configuration:

1. Connect the **15-pin D-type male** connector, at the one end of the Y-cable, to the BSR, as displayed in Figure 4-5.

2. Connect the **15-pin D-type male** connector, at the other end of the Y-cable, to the SDA or BSDU, as displayed in Figure 4-5.

3. Connect the **9-pin D-type** (RS232) connector, at the other end of the Y-cable, to the PC, as displayed in Figure 4-5.

BSDU (rear panel)

15-pin port

15-Pin D-type male
connector

15-Pin port

BSR

15-Pin D-type connector
(only 9 pins used for serial
interface)

9-Pin D-type (RS232)
male connector

PC
running WipConfig
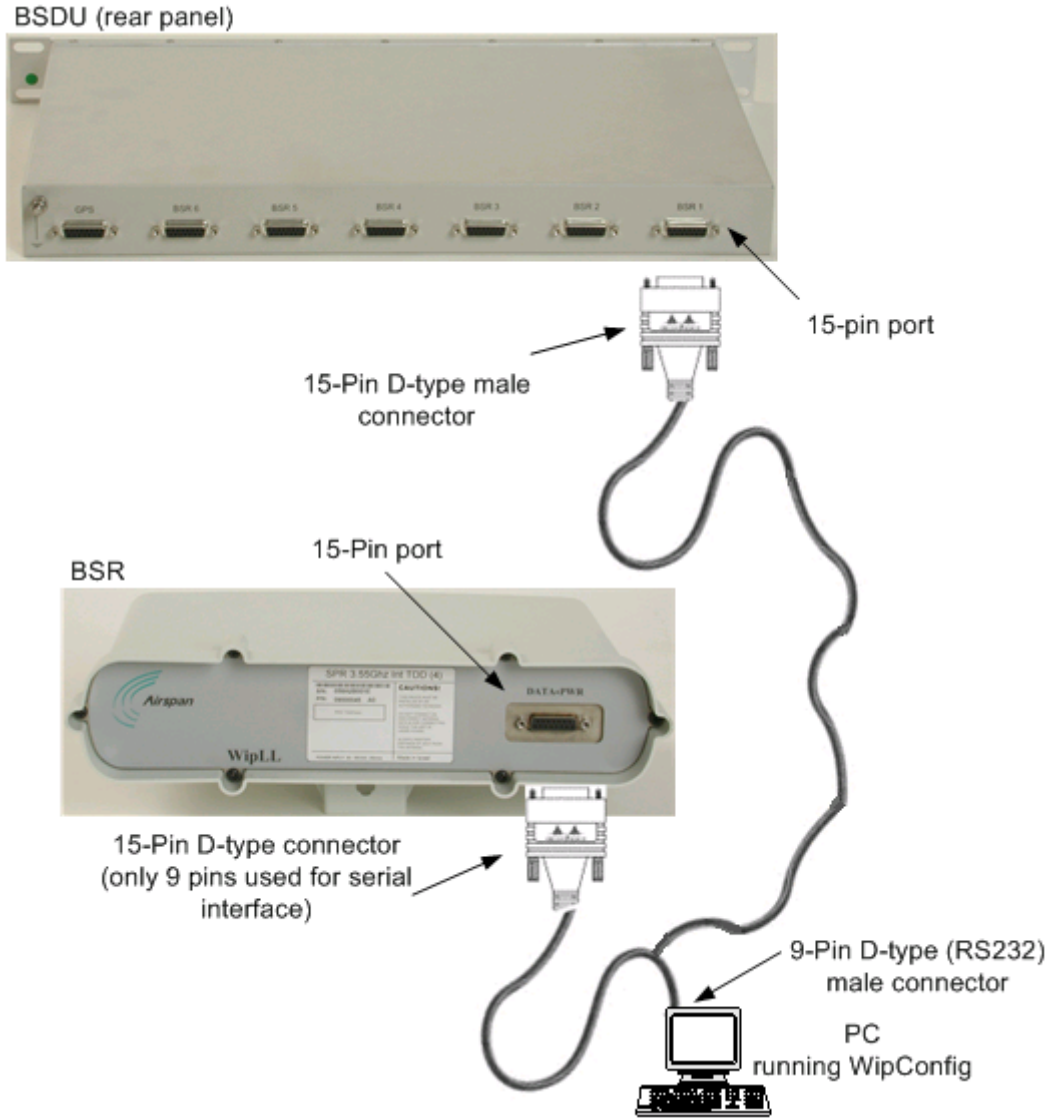
Figure 4-5: PC-to-BSR Serial Connection using Y-shaped Cable

4.5. Connecting BSR to the Backhaul Network

The BSR connection to the customer's backhaul network depends on the base station's configuration:

■ For base stations consisting of single BSRs, the connection to the backhaul is through the SDA

■ For base stations consisting of multiple BSRs, the connection to the backhaul is through the BSDU.

4.5.1. Through the SDA

For a base station consisting of a single BSR, the BSR's power supply and connectivity to the backhaul network is provided by the SDA. The SDA is typically installed at the subscriber's premises, but in such a scenario, the SDA can also be used at the base station. For a detailed description of the SDA, see Chapter 8, "Installing the SPR and SDA".

The BSR-to-SDA cable connection configurations is as follows:

■ **Connectors:**

■ **BSR:** 15-pin D-type male (only 8 pins are used)

■ **SDA:** 15-pin D-type male (only 8 pins are used)

■ **Cable:** straight-through CAT-5

■ **Connector pinouts:**

    ■ **BSR:**

BSR (15-Pin D-type)	
Pin	**Function**
1	+ 48VDC
2	- 48VDC
3	+Tx
4	-Tx
5	+Rx
6	-Rx
7	+Sync.
8	-Sync.
9	Not connected (NC)
10	NC
11	NC
12	NC
13	NC
14	NC
15	NC

■ **SDA** models (SDA-1, SDA-4H, and SDA-4S)**:**

SDA (15 Pin D-type)	
Pin	**Function**
1	+48VDC
2	-48VDC
3	+RX
4	–RX
5	+TX
6	–TX
7	NC
8	NC
9	NC
10	NC
11	NC
12	NC
13	NC
14	NC
15	NC

Note: Airspan supplies unterminated cables for 15-Pin D-type connectors. Refer to the cable crimping procedures for 15-Pin D-type connectors detailed in Appendix B, "Cable Crimping".

To connect the BSR to the backhaul through the SDA:

1. Attach the **15-pin D-type** connector, at one end of the cable, to the BSR's 15-pin D-type port labeled **DATA POWER SYNC**, as displayed in Figure 4-6.

2. Attach the **15-pin D-type** connector, at the other end of the cable, to the SDA's **15-pin D-type** port, as displayed in Figure 4-6.

3. Connect the SDA's RJ-45 Ethernet port to the backhaul.

Note: SDA is available in six models. For a detailed description of the SDA models, see Chapter 8, "Installing the SPR and SDA".
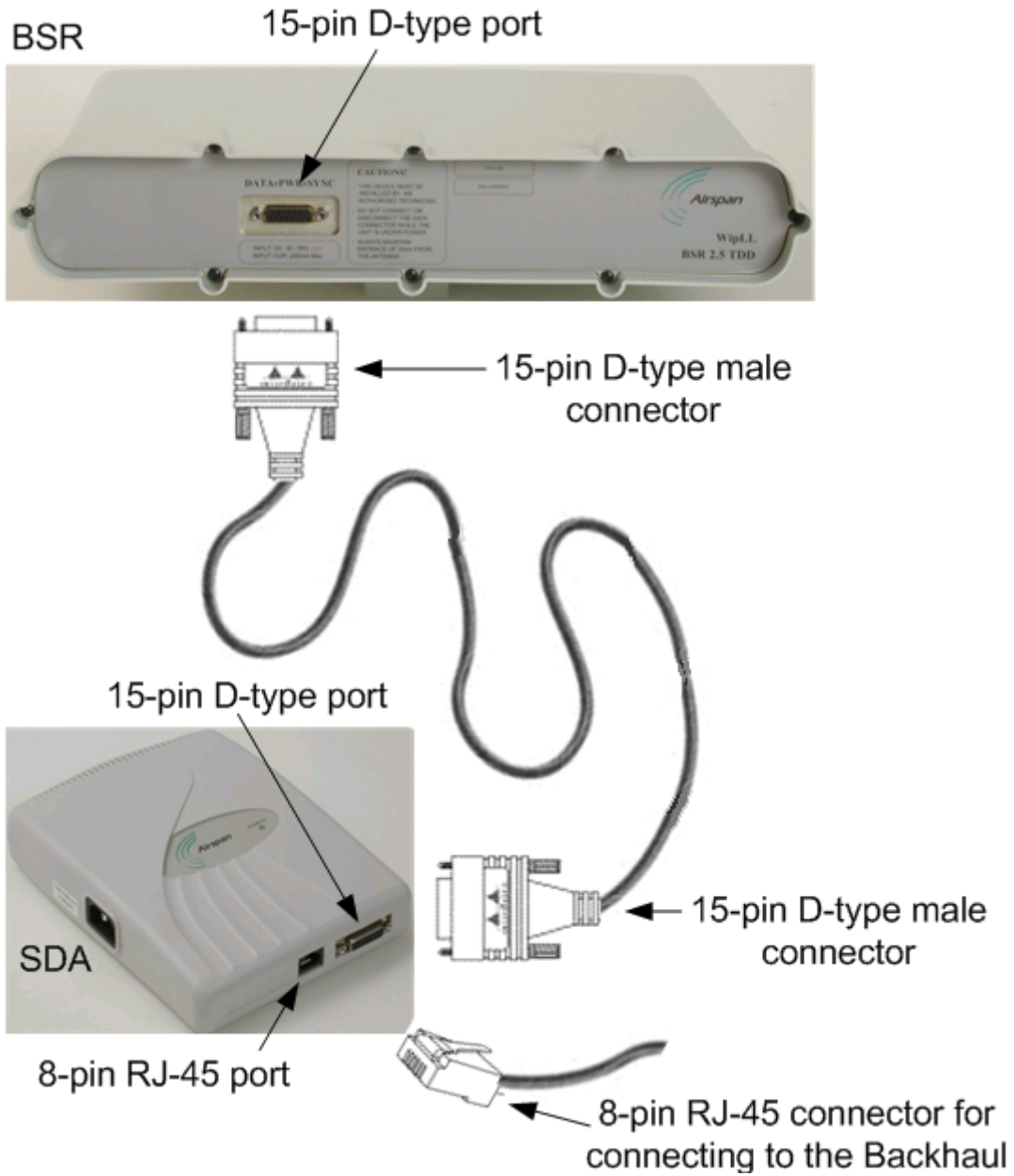
Figure 4-6: Connecting BSR to the backhaul through the SDA

4.5.2. Through the BSDU

For base stations consisting of multiple BSRs, the power supply and connectivity to the backhaul network is provided by the BSDU. The BSR's 15-pin D-type port is connected to the BSDU's rear panel 15-pin D-type port (labeled **BSR #**).

> **Note:** For a detailed description of the BSDU, see Chapter 5, "Installing the BSDU".

The BSR-to-BSDU cable connection configurations is as follows:

- **Connector:**

  - **BSR:** 15-pin D-type male (only 8 pins are used)

  - **BSDU:** 15-pin D-type male (only 8 pins are used)

- **Cable:** straight-through 10Base-T Ethernet 4 Pair Cat 5 outdoor type – 24 AWG

- **Connector pinouts:**

  - **BSR:**

BSR (15-pin D-type)	
Pin	**Function**
1	+ 48VDC
2	- 48VDC
3	+Tx
4	-Tx
5	+Rx
6	-Rx
7	+Sync.
8	-Sync.
9	Not connected (NC)
10	NC
11	NC
12	NC

BSR (15-pin D-type)	
Pin	**Function**
13	NC
14	NC
15	NC

■ **BSDU:**

BSDU (15-pin D-type)	
Pin	**Function**
1	+48VDC
2	-48VDC
3	+RX
4	–RX
5	+TX
6	–TX
7	NC
8	NC
9	NC
10	NC
11	NC
12	NC
13	NC
14	NC
15	NC

Note: Airspan supplies unterminated cables for 15-Pin D-type connectors. Refer to the cable crimping procedures for 15-Pin D-type connectors detailed in Appendix B, "Cable Crimping".

To connect the BSR to the backhaul through the BSDU:

1. Attach the **15-pin D-type** connector, at one end of the cable, to the BSR's 15-pin D-type port labeled **DATA POWER SYNC**, as displayed in Figure 4-7.

2. Attach the **15-pin D-type** connector, at the other end of the CAT-5 cable, to the BSDU's **15-pin D-type** port labeled **BSR**, located at the rear of the BSDU, as displayed in Figure 4-7.

3. Connect one of the BSDU's 100Base-T ports, located at the front panel, to the backhaul (see Chapter 5, "Installing the BSDU" for a detailed description of connecting the BSDU to the backhaul).

Figure 4-7 displays the cable connections between the BSR and BSDU.
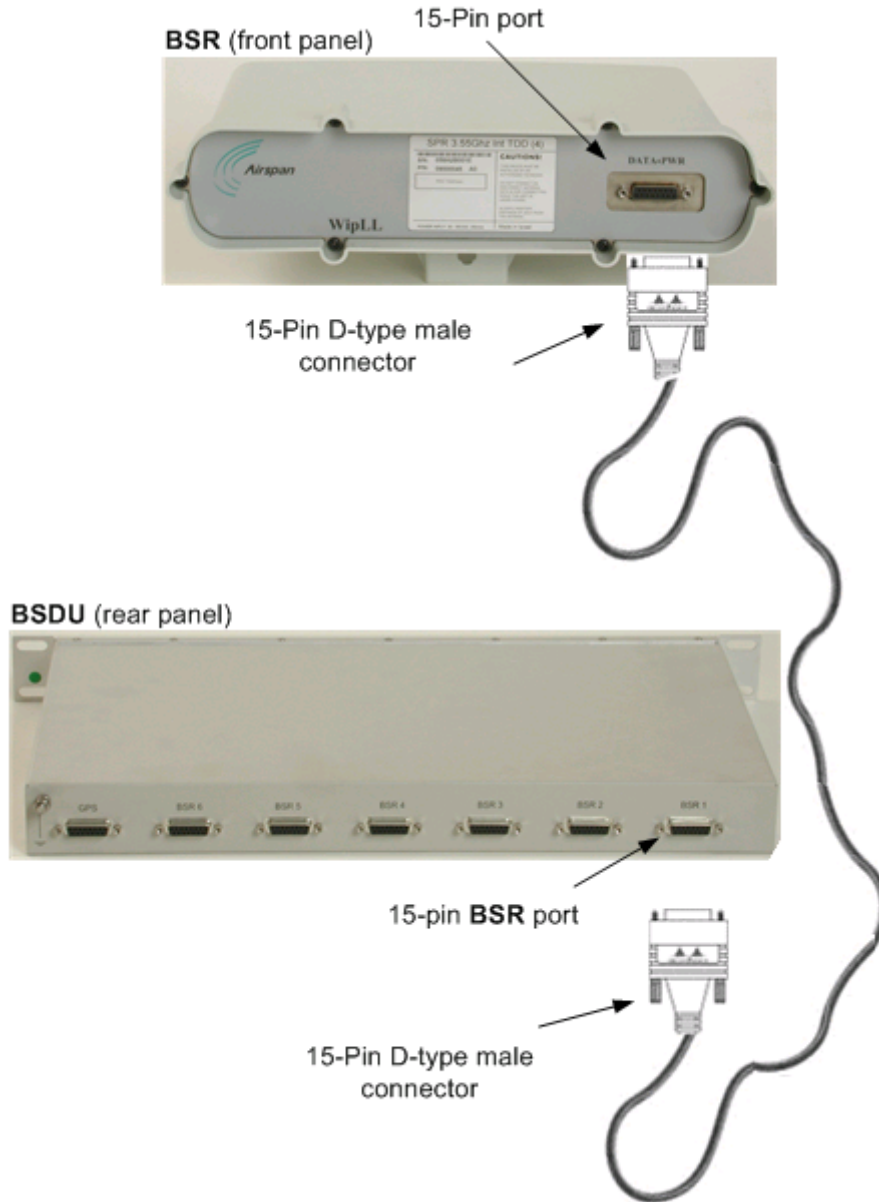
Figure 4-7: BSR-to-BSDU cable connection

4.6. Conecting a Third-Party External Antenna (Optional)

The BSR model with an N-type connector can be connected to an external antenna (see Figure 4-9). The addition of an external antenna allows greater RF sector coverage than the standard BSR Internal Antenna model (i.e., 60°). The BSR with an external antenna is especially suited for base stations with one BSR, where sector coverage can be increased to 360° by using an omni-antenna.

■ **Connector:** N-type male

Figure 4-8: Example of an N-type connector

■ **Cable:** RF

To connect the BSR to an external antenna:

1. Attach the **N-type male** connector to the N-type receptacle located on the BSR's front panel.

2. Attach the other end of the cable to the external antenna.

Note: For crimping cables for N-type connectors, see Appendix B, "Cable Crimping".

N-type antenna connector

Figure 4-9: BSR model with N-type antenna connector

4.7. Connecting the BSR to Power

The BSR is powered by the SDA or BSDU (depending to which unit the BSR is connected). The power is supplied through the BSR's 15-pin D-type port, which is connected to the SDA or BSDU.

The BSR's power requirements are described in Table 4-3.

Table 4-3: BSR Power Requirements

Parameter	Value	Comment
Voltage: • Minimum • Maximum	48 VDC nominal • 30 VDC • 55 VDC	Voltage is received from the BSDU or SDA
Maximum Amperes:	500 mA	

Note: For details on connecting the SDA or BSDU to the mains power supply, see Chapter 5, "Installing the BSDU" and Chapter 8, "Installing the SPR and SDA".

4.8. Mounting the BSR

The BSR can be mounted on a wall or pole (see Figure 4-14). The BSR is mounted using the mounting holes located on the BSR's bottom panel, and the mounting bracket (provided by Airspan). The mounting brackets for BSR wall- and pole-mounting are different.

4.8.1. Minimum Distance Between BSRs

To prevent system interference, each BSR requires a minimum of 1-metre separation between adjacent BSRs (see Figure 4-10).
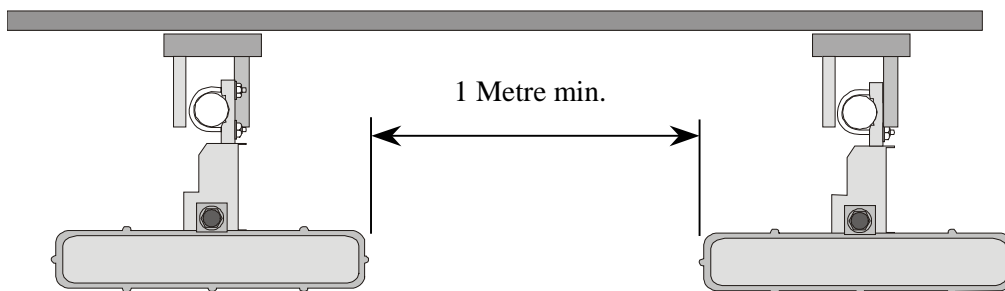
Figure 4-10: Minimum distance between mounted BSRs

Warning: The BSR emits microwave radiation; a minimum distance of 250 mm must be maintained from the front of the BSR.

4.8.2. Wall Mounting

BSR wall mounting is performed in two chronological stages:

■ Attaching the mounting bracket to the BSR's mounting holes.

■ Attaching the mounting bracket (attached to the BSR) to the wall.

To mount the BSR on a wall:

1. Attach the mounting bracket to the BSR using two stainless steel bolts, as shown in Figure 4-11.
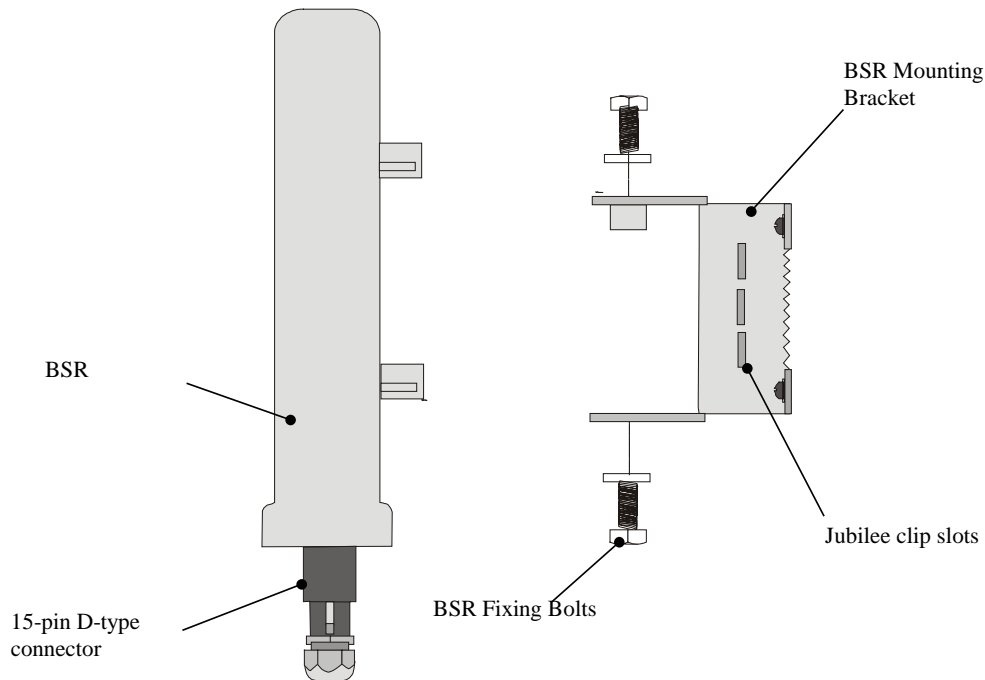
Figure 4-11: Attaching the mounting bracket to the BSR

2. Attach the mounting bracket to the wall using four screws. The fixing dimensions for the mounting bracket is illustrated in Figure 4-12

Note: Airspan does not provide screws for attaching the mounting bracket to the wall. The screw size depends on the structure of the building to which the bracket is to be attached. When selecting screw sizes, consideration must be given to the weight of the BSR and load that may be induced in windy conditions.
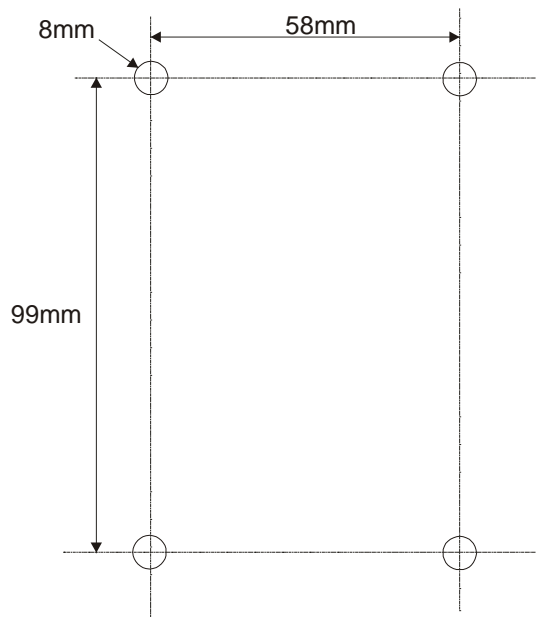
Figure 4-12: BSR mounting bracket dimensions for the four fixing holes

3. Adjust the horizontal positioning of the BSR, and then fasten tight the two stainless-steel bolts.

Rotation is restricted to the horizontal plane only. The permissible rotation is shown in Figure 4-13.
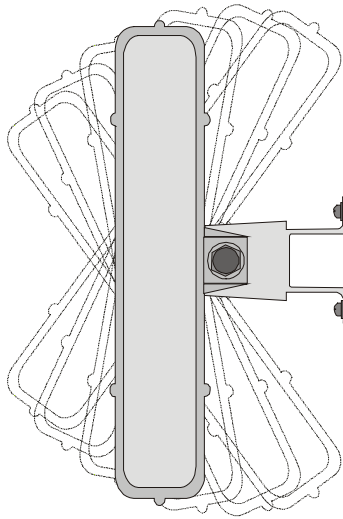
Figure 4-13: Horizontal rotation of the BSR

Note: A thread-locking compound is to be used to prevent the bolts working loose.

4.8.3. Pole Mounting

The BSR can be mounted on a pole (see Figure 4-14). Pole mounting allows the BSR to be adjusted in the horizontal as well as the vertical plane. The pole-mounting bracket assembly is designed to support the BSR on a round pole of 45 mm in diameter.

Figure 4-14: Mounted BSR

To mount the BSR on a pole:

1. Attach the mounting bracket to the BSR using two stainless steel bolts.

Locking Holes

BSR mounting Bracket

Pivot Hole

Clamping Bracket
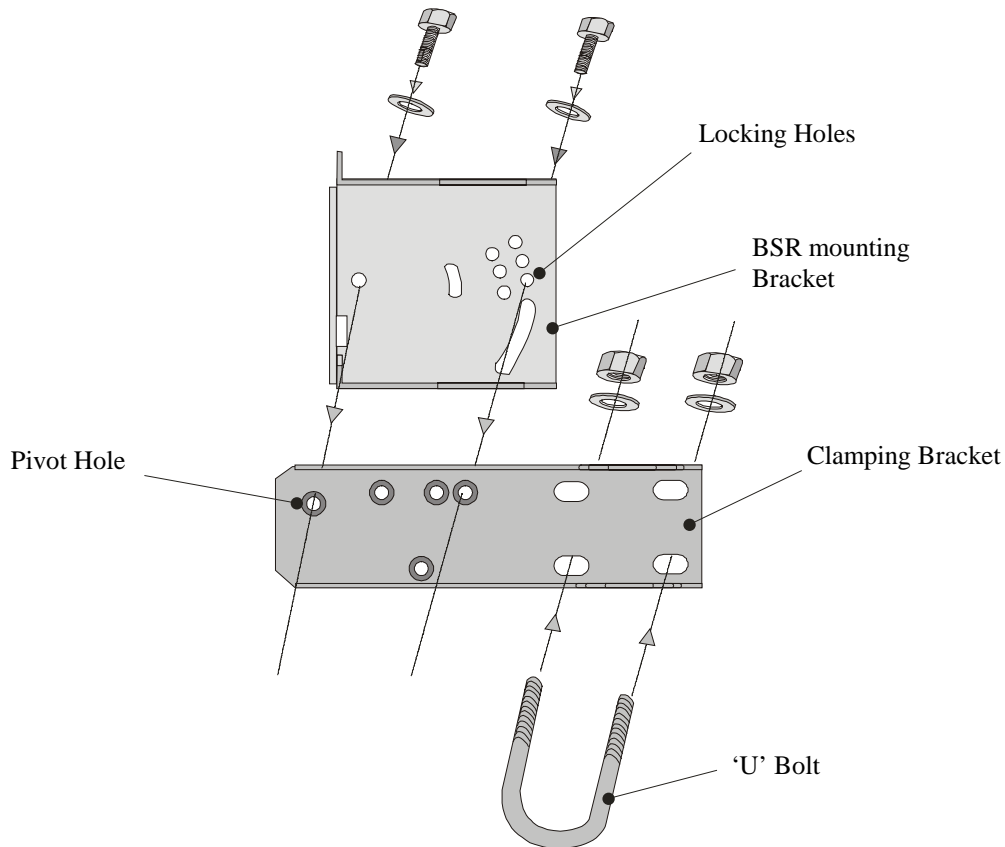
'U' Bolt

Figure 4-15: BSR mounting bracket assembly

2. Attach the clamping bracket to the mounting bracket using two M8 stainless bolts.

3. Attach the Clamping bracket to the pole by placing the U-bolt around the pole, and then inserting the U-bolt through the Clamping bracket and securing it by screwing the two bolts on the U-bolt.

4. Adjust the vertical position of the BSR. Lock the BSR at the desired position by inserting the locking bolt in the desired position. Once the correct angle has been set both bolts must be tightened to lock the BSR bracket in place.

5. Adjust the horizontal position of the BSR by rotating the BSR about the pole, and then tighten the U-bolt.

    BSR positioning is obtained in two planes by adjustment of the mounting bracket assembly a shown in Figure 4-16.

Rotation about the
mounting bracket

Rotation about the
mounting pole
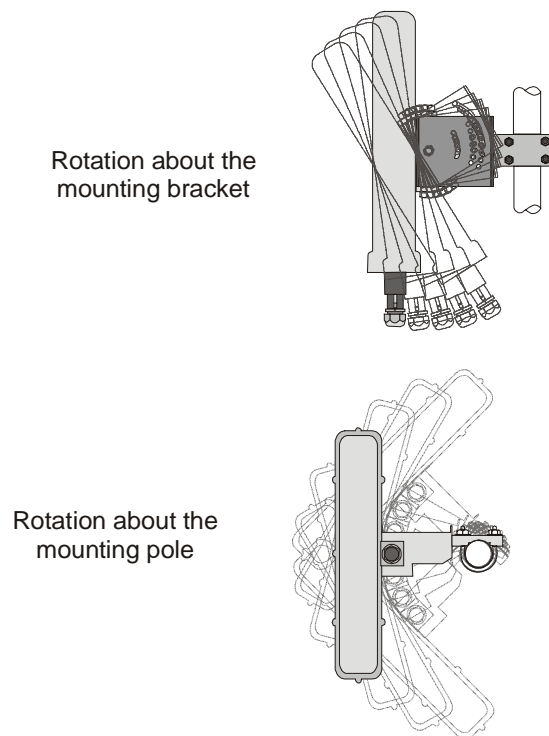
Figure 4-16: BSR GPS orientation in vertical (top figure) and horizontal plane (lower figure)

Note: A thread-locking compound is to be used to prevent the bolts working loose. A loop should be left in the cable for maintenance purposes and to prevent the cable weight being taken directly on the connector.

Installing the BSDU

The WipLL **Base Station Distribution Unit** (**BSDU**) is an optional WipLL unit that connects multiple BSRs at a base station. The BSDU is installed in the customer's cabinet at the base station.

The BSDU provides the following:

■ Serves up to six BSRs. Up to four BSDUs can be daisy-chained in a single base station to support up to 24 BSRs.

■ Power supply of –48 VDC to BSRs.

■ Wide Area Network (WAN) interface to the customer's backhaul network.

■ Frequency-hop synchronization.

Figure 5-1: BSDU front panel

5.1. BSDU Characteristics

■ Size: 19" rack mounting practice, 1-U vertical space requirement

■ Weight: 3.1 Kg

■ Power Rating: 200 watts (when connected to six BSRs and a GPS)

■ Voltage: -48 VDC nominal (Minimum -38 VDC; Maximum -55 VDC)

■ Environmental conditions:

    ■ Operating temperature: 0ºC to +50ºC

    ■ Humidity: 90% at 30ºC

5.2. Mounting the BSDU in the Cabinet

The BSDU is a 1U-chassis which is installed in a standard 19" (inch) cabinet, and is provided with front-rail mounting brackets. The mounting brackets are part of the BSDU chassis. Therefore, all that is required for mounting the BSDU is to attach the BSDU mounting brackets to the cabinet.

The BSDU is secured to the mounting rails in the WipLL system cabinet using the supplied four M5 mounting screws and plastic cup washers.

1. Determine which cabinet holes—left and right side--will be used for attaching the chassis.

2. Insert four nuts into the holes you specified in Step 1.These nuts are housed in Tinnerman clips, which allow you to fasten them into the holes. Hold the clips, squeeze them, and insert them into the hole.

3. Carefully insert the BSDU into the cabinet, aligning the BSDU's mounting brackets with the holes.

4. Insert the M5-mounting screws, with plastic washers, in the BSDU mounting bracket screw holes, on each side, as shown Figure 5-2. In this way, the chassis is supported until you tighten the chassis screws.

5. Tighten the M5 mounting screws to fasten the chassis to the cabinet.
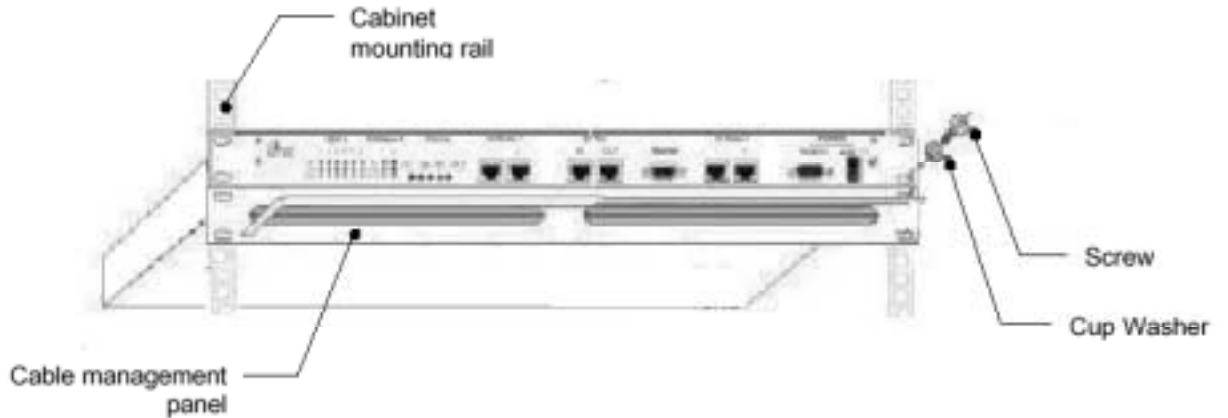
Figure 5-2: BSDU and cable management panel mounting method

> **Note:** When mounting multiple BSDUs in a cabinet, vertical space—above and below—is required for threading cables to the rear.
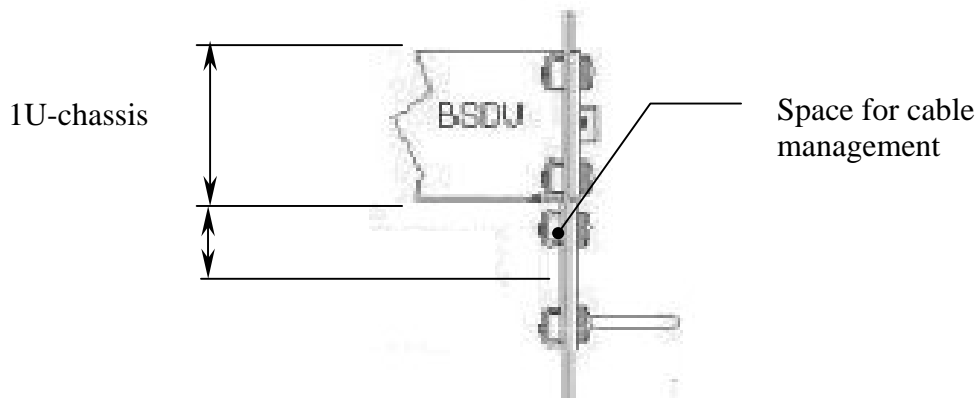
Figure 5-3: BSDU and vertical space for cables

5.3. Cabling the BSDU

Warning:
To avoid electrical shock and fire hazard ensure that all data and power connections are made prior to connecting the BSDU to the DC power supply.

When installing the BSDU, it is required to wear the wrist strap for ESD.

The BSDU offers services to the WipLL network via both front and rear panels. interface connections available via the BSDU front panel are as follows:

■ Two off RJ45: 100Base-T ports

■ Two off RJ45: 10Base-T ports

■ One RJ-45: Input for synchronization with previous BSDU in ring

■ One RJ-45: Output for synchronization with next BSDU in ring

■ One 9-Pin D-type (female) monitor serial port– WipManage interface.

■ One 9-Pin D-type (male) Base Station Power System (BSPS) interface port

■ DC power input connector -48VDC

■ Activity indicator LED's.

Figure 5-4 shows the front panel of the BSDU.

DC input

Activity LEDs

100BaseT ports

Synchronization ports

BSPS port

10BaseT ports

Monitor port
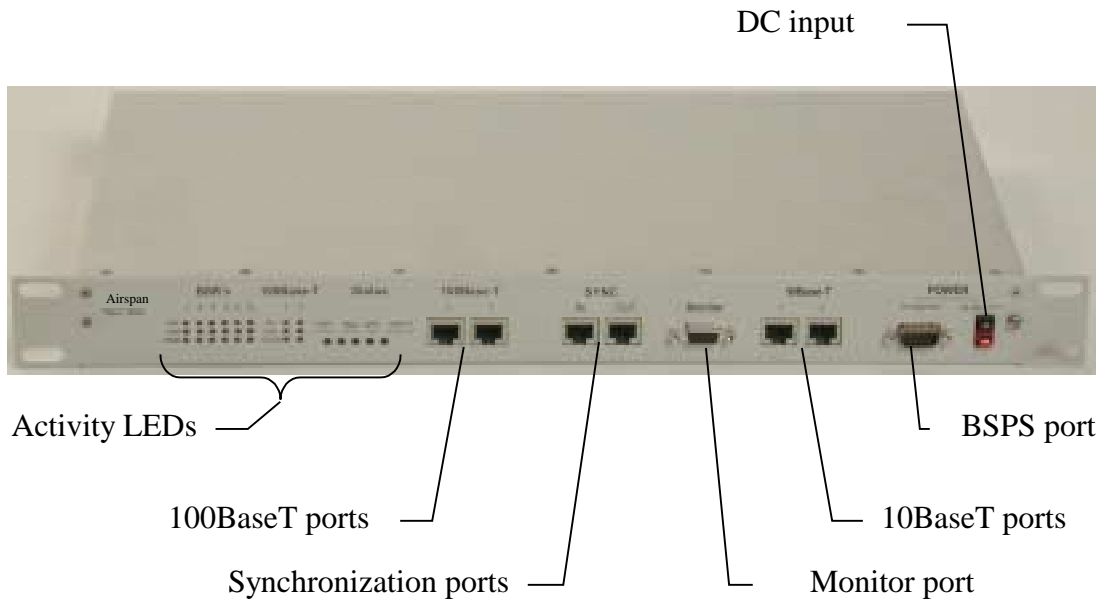
Figure 5-4: BSDU front panel

Interface connections available via the BSDU rear panel are as follows:

■ Six 15-Pin D-type connectors which provide DC power, Ethernet connection, Synchronization and Serial interface to the BSR

■ One 15-Pin D-type connector for the Global Positioning System (GPS) antenna

■ One 5 mm diameter grounding stud

Figure 5-5 shows a rear panel view of the BSDU.

GPS port

Earth Stud

Six BSR ports

Figure 5-5: BSDU rear panel

> **Note:** Airspan supplies unterminated cables for 15-Pin D-type and N-type connectors. Refer to the cable crimping procedures for these connectors in Appendix B, "Cable Crimping".

5.3.1. Connecting BSRs to the BSDU

The BSDU rear panel provides six 15-Pin D-type connectors for connecting a maximum of six BSRs. For a detailed description of connecting BSRs to the BSDU, see Chapter 4, "Installing the BSR".

> **Note:** A maximum of six BSDUs can be installed at a base station, allowing the connection of up to 36 BSRs.

- **Connector**: 15-Pin D-type (male)

- **Connector pinouts**: see Chapter 4, "Installing the BSR".

5.3.1.1. BSR LED indicators

The BSDU front panel includes three LEDs for each of the six BSRs. These LEDs are described in the following table:

LED	LED Status	Meaning
Act	On	Ethernet activity is detected
	Off	No Ethernet activity is detected
Link	On	Physical link exists between devices
	Off	No physical link exists between devices
Power	On	Current is supplied to the port
	Off	Port is disabled by software, or port failure

5.3.2. Connecting the GPS antenna

The rear panel of the BSDU provides a 15-Pin D-type connector port—labeled **GPS**—for connection to the GPS antenna for clock synchronization. The GPS allows synchronization between base stations.

For a detailed explanation on connecting the GPS to the BSDU port, see Chapter 6, "Installing the GPS".

5.3.3. Connecting to 100Base-T Networks

The BSDU's front panel provides two RJ-45 ports for connection to 100Base-T (labeled **100Base-T**) ports. The 100Base-T ports are for connection to the management station and Ethernet.

Connector: 8-Pin RJ-45 (male)

Connector pinouts:

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data-
7	NC	Not connected
8	NC	Not connected

5.3.3.1. 100Base-T LED indicators

The BSDU front panel includes three LEDs for each of the two 100Base-T ports. These LEDs are described in the following table:

LED	Status	Meaning
Rx	On	Data is received through the port
	Off	No data is received through the port
Link	On	Correct physical link between devices
	Off	No physical link between devices
100	On	Power is supplied to port
	Off	No power at port

5.3.4. Connecting Sync IN/OUT ports

The BSDU's front panel provides an in/out synchronization 8-Pin RJ-45 ports for synchronization between BSDUs at the base station. The **SYNC OUT** of the master BSDU is connected to the **SYNC IN** of a slave BSDU, which then connects its **SYNC OUT** to the **SYNC IN** of another slave BSDU, and so on.

Connector: 8-Pin RJ-45 (male)

Cable: straight-through cable

Connector Pinouts:

■ Synch IN

Pin	Name	Description
1	TD+	Transmit data to GPS
2	TD-	Transmit data from GPS
3	RX+	Receive Data (hop synchronization)
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data (hop synchronization)
7	1PPS+	GPS pulse per second
8	1PPS-	GPS pulse per second

■ Synch OUT

Pin	Name	Description
1	TD+	Transmit data to GPS
2	TD-	Transmit data from GPS
3	TX+	Transmit Data (hop synchronization)
4	RD+	Receive Data (from GPS)
5	RD-	Receive Data (to GPS)
6	TX-	Transmit Data (hop synchronization)
7	1PPS+	GPS pulse per second
8	1PPS-	GPS pulse per second

5.3.5. Connecting the Power Management port

The BSDU's front panel provides a 9-Pin DB-type port for serial RS-232 power management of the BSPS. WipLL's WipManage manages BSPS by connecting to the BSDU through the IP network (i.e., from the BSR), and then manages BSPS through the serial connection between the BSDU and BSPS. The reason for the serial connection is that the BSPS does not support SNMP-based management, which is the bases of WipManage.

Connector: depending on the BSPS model:

■ 9-Pin DB-type male (BSDU and BSPS)

■ 9-Pin DB-type male (BSDU) to 8-Pin RJ-45 (BSPS) (see Figure 5-6)
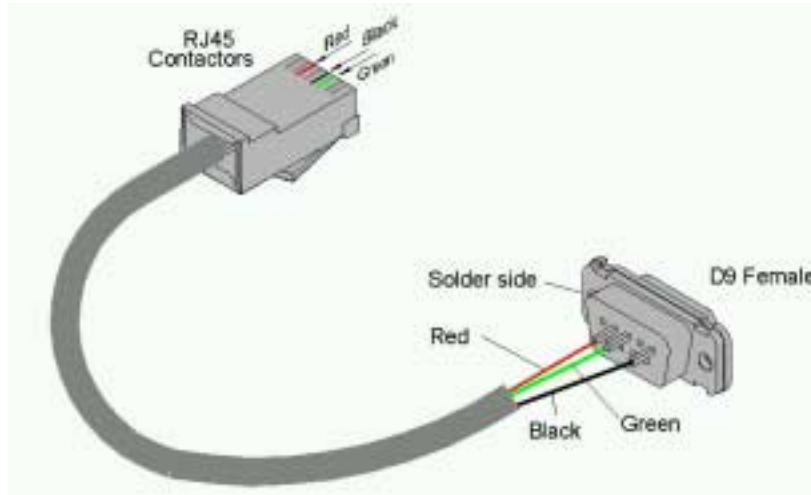
Figure 5-6: BSDU-to-BSPS management connectors – RJ-45 to 9-Pin D-type

Cable length: 60 cm

Connector pinouts:

9-Pin D-type				RJ-45	
Pin	**Name**	**Description**		**Pin**	**Name**
1	NC	Not connected		1	NC
2	RX	Receive Data		2	NC
3	TX	Transmit Data		3	RX
4	NC	Not connected		4	NC
5	GND	Ground		5	GND
6	NC	Not connected		6	TX
7	NC	Not connected		7	NC
8	NC	Not connected		8	NC

5.3.6. Connecting Cables for BSDU Serial Management

The BSDU's front panel provides a 9-Pin D-type port for serial management (labeled **Monitor**) of the BSDU. Serial management allows you to connect the WipLL's network management system (WipConfig) to BSDU without assigning BSDU an IP address.

■ **Connector:** 9-pin D-type male

■ **Cable:** straight-through

■ **Connector pinouts:**

9-Pin D-type Connector	
Pin	Signal
1	Not connected (NC)
2	RX
3	TX
4	NC
5	NC
6	NC
7	NC
8	NC
9	NC

To connect the PC to the BSDU by serial connection (see Figure 5-7):

1. Connect the **9-pin D-type female** connector to the PC.

2. Connect the **9-pin D-type male** connector, at the other end of the cable, to the BSDU's serial port (labeled **Monitor**).
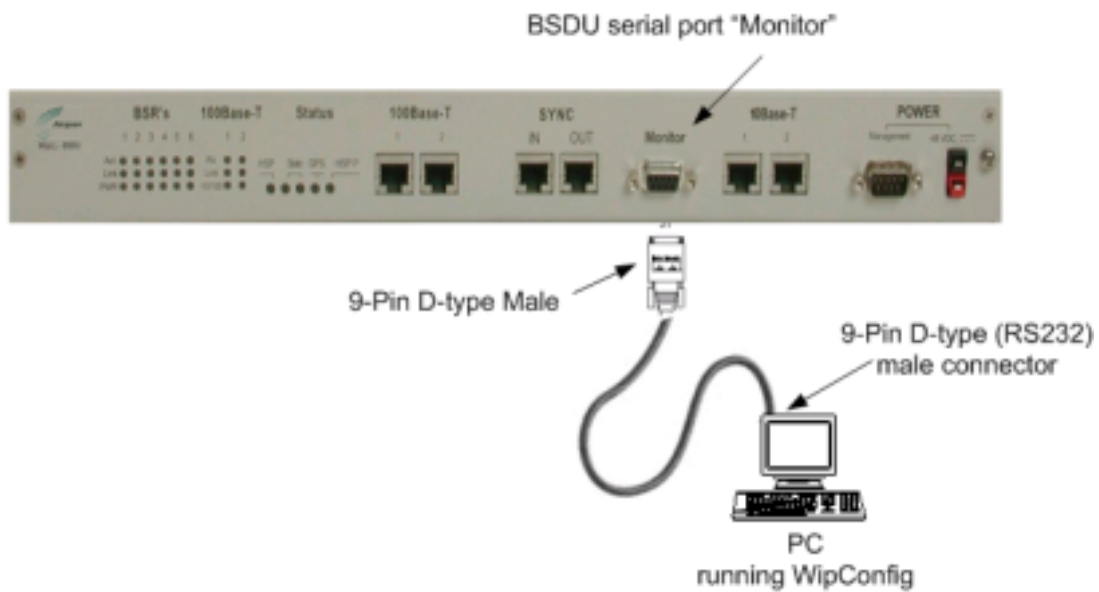
Figure 5-7: PC-to-BSDU Serial Connections

5.3.7. Connecting Cables for BSDU Network IP Management

For network (IP) configurations, you can connect the PC to the BSDU's local port, or remotely (from anywhere) if you have IP connectivity to the device. For PC-to-BSDU local network (IP) connections you need to connect the PC to the BSDU's 10BaseT or 100BaseT port. The BSDU's front panel provides two 10Base-T ports: left is labeled **10Base-T 1**; right is labeled **10Base-T 2**. Port **1** provides PC management interface to all BSRs connected to the BSDU. Port **2** provides management interface only to the BSDU. If you connect the BSDU's two 10BaseT ports (i.e., loop the ports) to one another by a crossover cable, then you can connect the PC to one of the BSDU's 100BaseT ports. If the two BSDU 10BaseT ports are not connected to one another, then you need to connect the PC to the BSDU's right-most 10BaseT port (labeled **10Base-T 2**).

> **Note:** For WipLL management, it is recommended to connect Port 1 to Port 2 by a cross-over cable, and then connect the management station (PC) to one of the 100Base-T ports. In such a setup, you can provide management to all daisy-chained BSDUs and their associated BSRs through one 100Base-T port.

■ **Connector**: 8-Pin RJ-45 (male)

■ **Cables:**

   ■ Crossover cable for looping the two 10BaseT ports

   ■ Straight-through for connecting the PC to the 100BaseT port

■ **Connector pinouts:**

RJ-45 (10Base-T)	
Pin	**Signal**
1	+RX
2	-RX
3	+TX
4	NC
5	NC
6	-TX
7	NC
8	NC

RJ-45 (100Base-T)	
Pin	**Function**
1	+TX
2	-TX
3	+RX
4	NC
5	NC
6	-RX
7	NC
8	NC

To connect the PC to the BSDU using a network connection:

1. Connect the **RJ-45** connector to the PC's Ethernet port.

2. Connector the RJ-45 connector, at the other end of cable, to the BSDU's 10Base-T port labeled **2** (see Figure 5-8);

    -Or-

    Connect the BSDU's two 10Base-T ports with the supplied crossover cable, and then connect the RJ-45 connector to the BSDU's 1000Base-T port (see Figure 5-9).
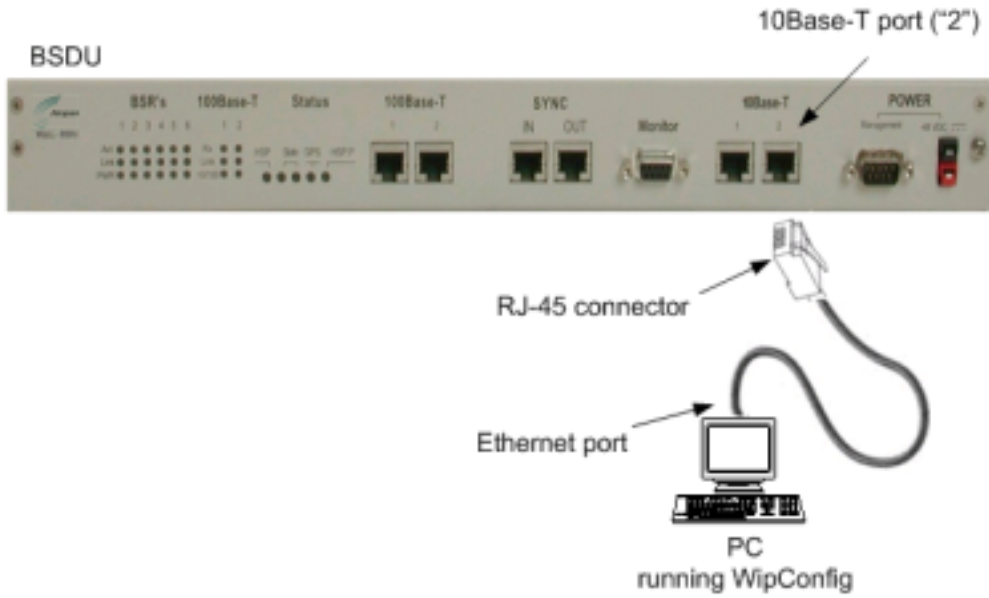
Figure 5-8: PC-to-BSDU Local Network Connection – 10Base-T Port
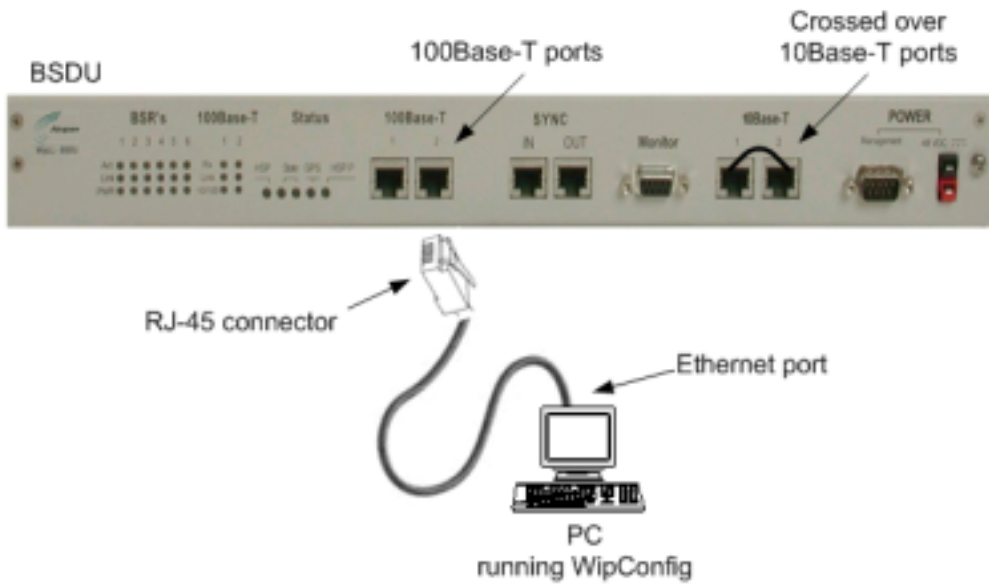
Figure 5-9: PC-to-BSDU Local Network Connection – 100Base-T Port

5.4. BSDU LED Status Indicators

The BSDU status LED indicators are located on the BSDU's front panel, as displayed in Figure 5-10.
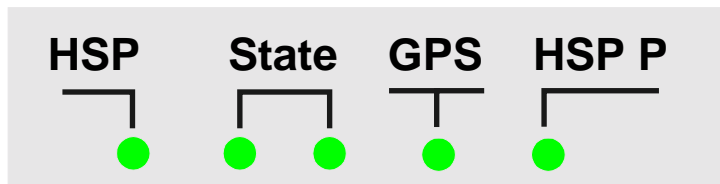
Figure 5-10: BSDU status indicator panel

The LED indicators include the following:

■ **HSP** (Hop Synchronization Process)—this LED indicates that the BSDU synchronization process is active.

■ **State**—the functions of the **State** LEDs are described in the following table:

Left LED	Right LED	Function
●	☀	Synchronization process is starting
☀	☀	This BSDU is the master unit
☀	●	This BSDU is a slave unit
●	●	BSDU sync pulse lost

■ **GPS** (Global Positioning Satellite)—this LED is lit when a GPS is connected to the BSDU. The LED flashes when receiving a satellite signal.

■ **HSP P** (Hop Synchronization Process Pulse)—this LED indicates the change state for the HSP pulse.

5.5. Connecting Power

The BSDU requires a power supply of –48 VDC. If the base station has no capabilities of supplying AC-to-DC voltage, the BSDU can be powered by an optional WipLL BSPS unit (see Chapter 7, "Installing the BSPS") that supplies –48 VDC power as well as power redundancy.

5.5.1. Grounding (Earthing) the BSDU

Before connecting the power supply to the BSDU, you need to ground the BSDU.

To ground the BSDU:

1. Connect one end of the grounding wire (green/yellow) to the grounding lug screw located on the rear panel of the BSDU chassis.

Grounding lug screw

Figure 5-11: BSDU rear panel with grounding lug screw

2. Connect the other end of the grounding wire to the cabinet rack or any other customer grounded point at the base station.

5.5.2. Connecting to Power Supply (BSPS)

The connection between the BSDU and the power supply unit (BSPS) is made via a two-meter long DC shielded power cable (supplied). The power cable has a power connector at each end of the cable and a wire for preventing cable disturbances and radiation. The power cable is connected to the BSDU's power connector.

The wire color-coding is as follows:

- **Red**: positive

- **Black**: negative

To connect the BSDU to the power supply unit:

1. Connect the cable's power connector side that provides an additional wire for preventing power radiation, to the BSDU's power port labeled **POWER -48 VDC**. Ensure that the black-colored (i.e., negative) side of the connector is inserted in the upper part of the power receptacle; and the red-colored (i.e., positive) side of the connector is inserted in the lower part of the power receptacle.

Power receptacle

Lug for power cable radiation immunity
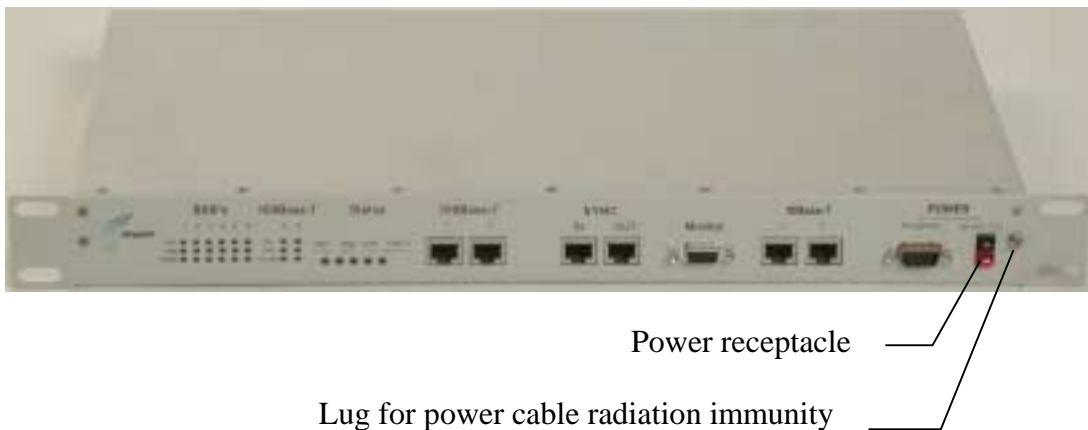
Figure 5-12: BSDU front panel with power port and screw attachment for power radiation immunity

2. Connect the power cable's yellow/green lug wire, for radiation immunity, to the BSDU chassis by using the screw attachment located alongside the BSDU's power receptacle, as displayed in Figure 5-12.

3. Connect the other end of the power cable to the power source (i.e., to the customer's power supply or to the WipLL BSPS).

6

Installing the GPS

The WipLL system provides BSDU connectivity to GPS antennas for synchronizing multiple base stations and avoiding RF ghosting effects. The GPS antenna ensures that the entire WipLL network operates with the same clock based on a universal satellite clock signal.

Figure 6-1: GPS antenna for clock synchronization

6.1. Mounting the GPS

Depending on individual customer requirements and environmental influences there are several available options for mounting the GPS:

■ **Pole Mounting:**

The GPS may be mounted to a pole similar to that used to mount the BSR (See Chapter 4, "Installing the BSR").

■ **Mounting Plate**:

The GPS may be mounted to a wall or roof top structure using a purpose-made mounting plate supplied with the unit.

■ **Direct Mounting**:

The unit may be mounted directly to a suitable structure that has been provided with holes suited to the GPS mounting details.

■ **Magnetic Mounting**:

An optional magnetic mounting device is available to allow GPS mounting to a suitable surface, e.g., vehicle roof or steel building structure. This device is attached by means of the threaded holes provided in the base of the GPS.

6.2. Connecting the GPS to the BSDU

The GPS antenna is connected to the BSDU's 15-Pin D-type port, labeled **GPS** (see Figure 6-2).

15-Pin D-type
port for GPS

Figure 6-2: BSDU rear panel showing GPS port

Note: Airspan supplies un-terminated cables for connecting the GPS to the BSDU. Refer to Appendix B, "Cable Crimping" for cable crimping procedures for these connectors.

The following describes the cables and connectors:

■ **Connector:**

   ■ **GPS:** 12-pin female (Deutsch MMP26C-2212S1)

   ■ **BSDU:** 15-Pin D-type male

■ **Cable:** Multipair Overall Shielded (22 AWG)

■ **Connector pinouts:** The GPS connector receptacle contains 12 male contacts, as displayed in Figure 6-3.
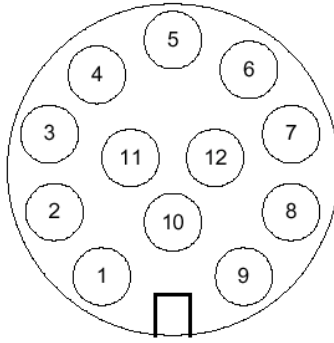
Figure 6-3: GPS connector pinouts

The connector pinouts for the GPS and BSDU are described in the following table.

12-pin female (GPS)			15-pin D-type male (BSDU)	
Pin	**Pin name**	**Cable color**	**Pin**	**Lead**
1	POWER	Red	9	
2	RX_DATA_1-	Blue	5	TD+ (after R5)
3	RX_DATA_1+	Black	6	TD-
4	TX_DATA_1-	Yellow	4	RD-
5	TX_DATA_1+	Black	3	RD+ (after R3)
6	RX_DATA_2-	Brown	x	
7	RX_DATA_2+	Black	x	
9	GND	Black	10	
11	1PPS+	Green	8	1PPS-
12	1PPS-	Black	7	1PPS+ (After R7)

To connect the GPS antenna to the BSDU:

1. Connect the **12-pin female** connector, at the one end of the cable, to the 12-pin receptacle connector located at the underside of the GPS.

2. Connect the **15-pin D-type male** connector, at the other end of the cable, to the 15-pin D-type port labeled "**GPS**" at the rear panel of the BSDU.

Figure 6-4 illustrates the BSDU-to-GPS cable connections.

Note:
When installing the cable, secure the cable to the mounting pole or bracket with a cable tie to hold the weight of the cable (cable strain relief).

A loop should be left in the dressed cable for maintenance purposes and to prevent the cable weight being taken directly on the connector itself.

If the cable is supplied by you, ensure that the connector is waterproof.

Warning: To avoid electrical or fire hazard, ensure that the connection to the GPS is made prior to connecting the BSDU to the power supply.
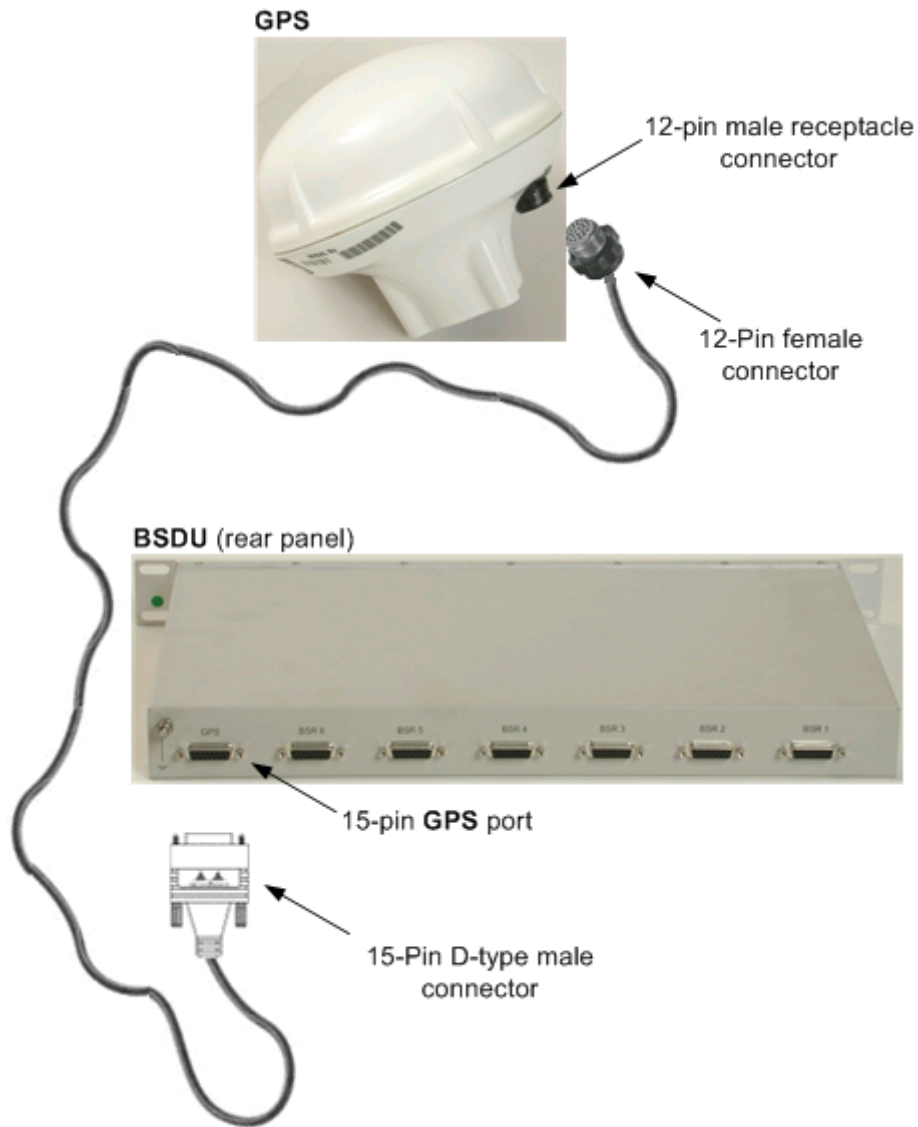
Figure 6-4: BSDU-to-GPS cable connections

![Airspan logo with large number 7]

Installing the BSPS

The WipLL **Base Station Power Supply** unit (BSPS) is an optional WipLL unit that supplies power (and power redundancy) to the BSDU/BSR if no –48 VDC power supply exists at the base station.

The BSPS front panel is displayed in Figure 7-1.

Figure 7-1: BSPS front panel

The BSPS provides the BSDUs/BSRs with the following:

■ Power supply of –48 VDC to BSDUs/BSRs

■ Power redundancy in case of power failure. The BSPS charges a battery bank that provides this power redundancy during mains failure. Thus, the BSPS acts as a DC-UPS with a battery connected to it. The size of the battery determines the backup and charging time. Since the system is current limited, the maximum battery size is based on that limit.)

■ Remote management and monitoring through WipLL's WipManage or WipConfig management application.

The BSPS is delivered pre-installed in an Airspan cabinet. The only installation that is required includes the following:

■ BSPS battery

■ BSPS temperature sensor to measure battery temperature

■ Connecting the BSPS to the BSDU

7.1. General Site Requirements

Note: Cable sizes and electrical circuit protection devices discussed in the following section are typical for 230 Volt AC circuits only. Adjustments are required for applications other than this.

During AC power installation activities at base station premises the following general requirements should be adhered to:

■ The customer must provide a valid safety certificate for the electrical circuit to which the equipment is to be connected. If this documentation is not available checks must be carried out in accordance with local electrical installation test requirements.

■ A qualified electrician must carry out the provision of any additional power outlets.

■ Cables used in the customer premises electrical circuit are to be 3-core 6mm^2. Color-coding for live neutral and earth conductors shall be in accordance with local electrical regulations.

■ The base station premises AC distribution panel must be capable of supplying up to 240 Volts AC.

■ The customer is to allocate and clearly identify fuses in AC distribution panel that will provide protection for equipment in BSPS cabinet. The circuit is to be protected by a 32 amp protective device in accordance with local standards.

■ The customer shall provide a wall mounted AC power socket adjacent to the BSPS cabinet. Local territory equipment isolation and earth leakage requirements are to be met when selecting the plug and socket type. Alternatively a 32-amp isolator switch may be used for connection to the mains power supply.

■ A common earth point (CEP) shall be designated in the customers' base station premises to which the system cabinet earth will be connected.

■ A minimum separation distance of 200 mm is to be maintained between AC and DC signaling cables when they run parallel to each other. However these cables may cross each other at right angles.

7.2. BSPS Components

The BSPS consists of the following basic components:

■ **DC Rectifier modules:** The Rectifier converts the AC current to DC. The BSPS can house up to four rectifiers. The rectifiers are "hot plugged" and operate in parallel. This enables the user to define an "N+1"or "N+2"redundant system. Each rectifier has its own current sharing system, satisfying a complete sharing among rectifiers.

■ **System controller**

■ **Electronic Low Voltage Detector (ELVD):** The LVD disconnects the battery from the load, avoiding damage to the battery when over-discharged.

■ **Battery**

■ **Load and battery circuit breakers** for DC protection and distribution

■ **DC Distribution unit:** The DC Distribution unit provides circuit breakers for distributing the output current to multiple BSDUs.

The unit also contains a bypass switch to bypass the LVD.

Note: For power redundancy, at least two rectifiers must be installed.

The main power rack is housed in a 19" (inches) front mountable chassis.

Figure 7-2 displays the BSPS main components.

DC Distribution module

Power ports for connection
to BSDUs

Rectifier module

Load Breaker

Battery Breaker

Line Breaker

System Controller
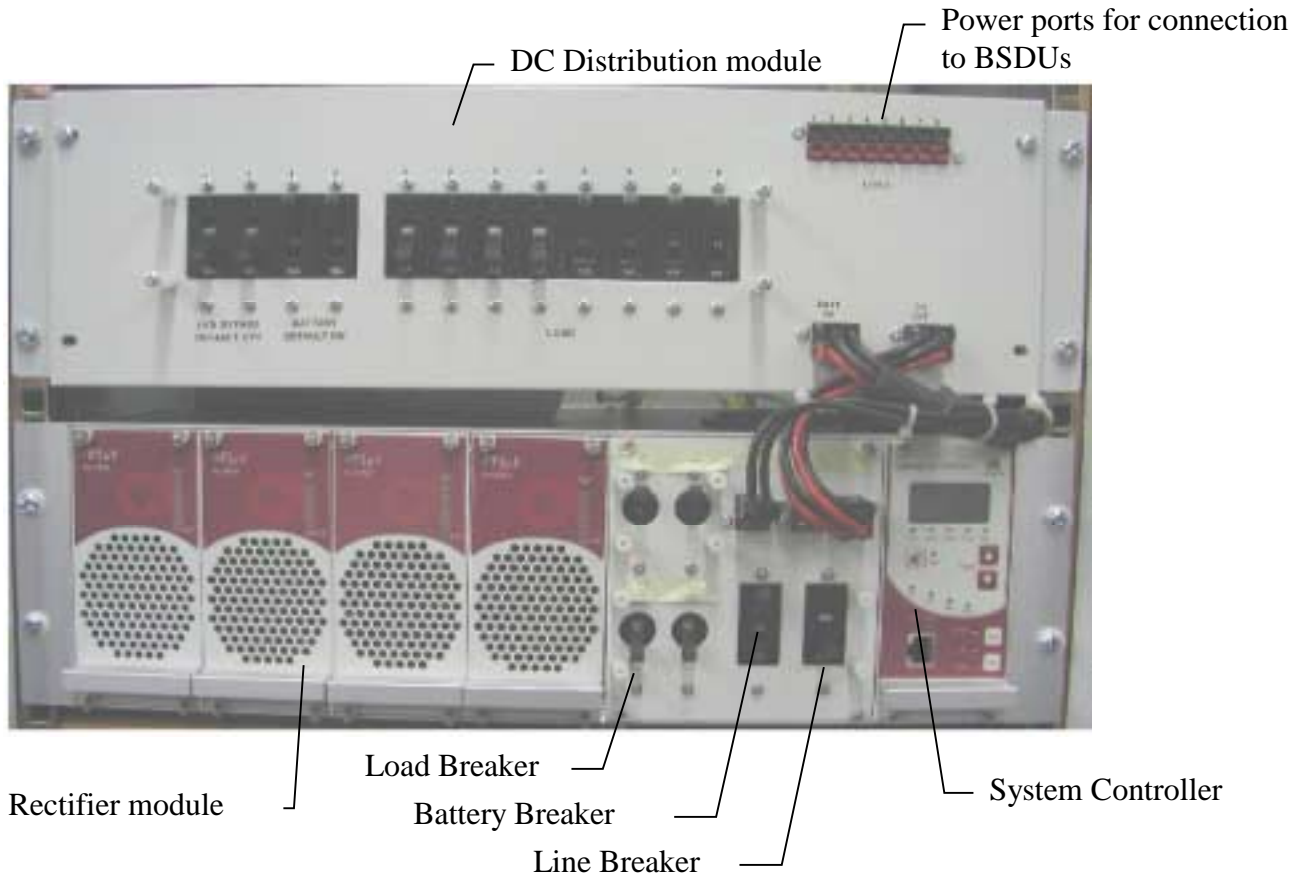
Figure 7-2: BSPS Main Rack front view

Figure 7-3 displays the rear panel of the main BSPS rack.
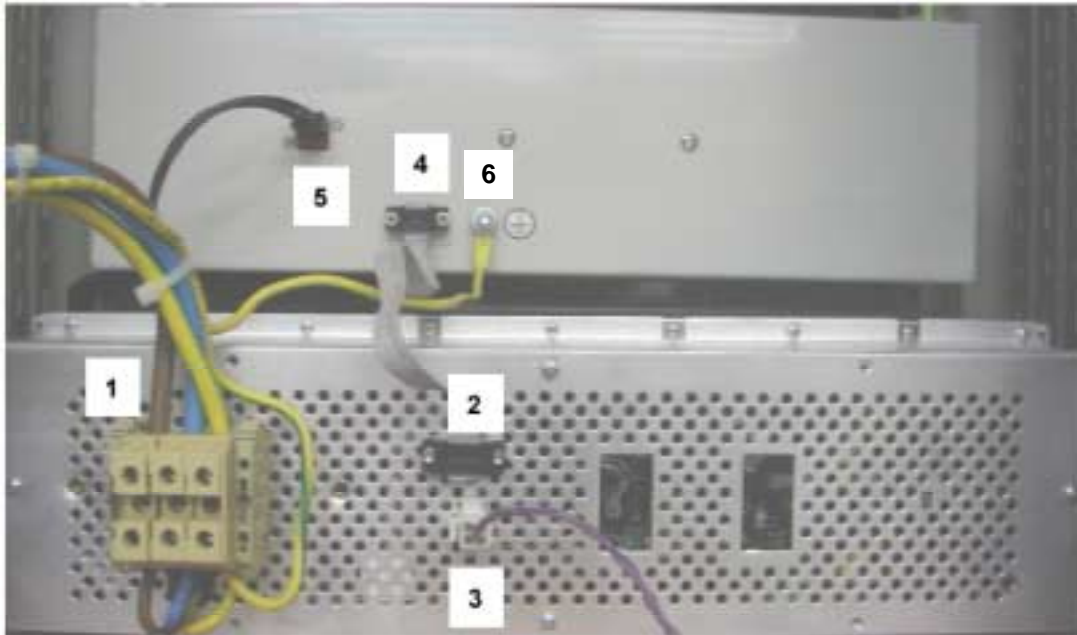
Figure 7-3: BSPS Main Rack rear view

1. AC connection

2. Comm to DC Distribution

3. Temperature Sensor

4. Comm to power system

5. LVD connection

6. Ground

7.2.1. Installing BSPS Batteries

To provide BSPS system back up power two battery circuits are provided. Batteries are located on two shelves fitted in the lower sections of the system cabinet.

A battery protection tray is to be fitted beneath the BSPS racks to prevent tools from falling onto batteries below.

⚠	**Warning:** Final battery connection, at the DC distribution rack, must only be made once the battery is fully installed. The Airspan insulated torque wrench 1PAC10383 AAD must be used when attaching battery terminations. The wrench is pre-set to 'break' at 5.5 Nm (Newton-meters). Caution must be observed when fitting and connecting batteries as to prevent the shorting of connections to the cabinet structure.

Insulated tools and the removal of jewellery are mandatory in all live power installations.

To install the BSPS battery:

1. Prior to installation use a digital multimeter (DMM) to measure the voltage output from each monobloc. A reading of 12.3 Volts DC is required from each monobloc.

2. Install the monoblocs onto the battery trays as shown in Figure 7-4.

Figure 7-4: Cabinet battery area

3. Up to four monoblocs can be housed on each shelf. Connections between the monoblocs are as illustrated in Figure 7-5.

4. Connect a short battery strap between monoblocs 1 and 2.

5. Using an insulated spanner/wrench tighten the battery terminal nut to the torque setting recommended by the manufacturer.

6. Using a digital multimeter check across the +ve and –ve terminals of the connected monoblocs and ensure that a voltage of 24 Volts DC is present.

7. Repeat the above steps for the connections between monoblocs 3 and 4.

8. Connect a long battery strap between monoblocs 2 and 3.

9. Using a digital multimeter check across the +ve and –ve terminals of monoblocs 1 and 4 and ensure that a voltage of 48 Volts DC is present.
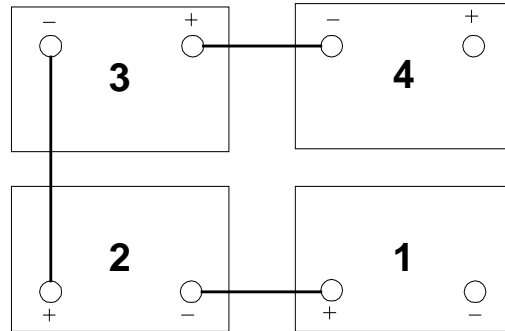
Figure 7-5: Method of interconnection between monoblocs

10. Protect the terminals of the monoblocs using suitable battery grease.

11. Before connecting the BSPS battery cables to the battery ensure that the battery isolation circuit breakers are in the OFF position.

12. Connect the red lead of the BSPS battery cables to the +ve terminal on monobloc 4.

13. Connect the black lead of the BSPS battery cable to the –ve terminal on monobloc 1.

Battery 1 connection   Battery 2 connection
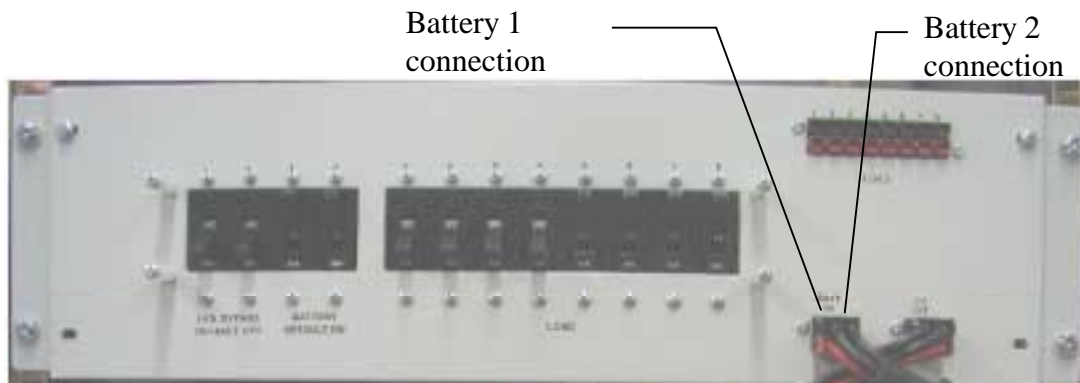
14. Check the voltage across the terminals battery input plug DC distribution rack using a DMM. Ensure that a reading of 48 volts DC is present. If so insert the plug into the corresponding socket on the front of the DC distribution rack.

15. Repeat the above steps for battery 2 if required.

> **Note:** If any faulty readings were recorded during the process, this would indicate a damaged monobloc or battery strap. Investigate and replace the faulty component.

7.3. Installation Summary of the BSPS

The following steps should be carried out when installing BSPS racks:

1. Verify that the circuit breakers of the load, battery and line input are disconnected and the system is not connected to the line.

2. Connect the main unit to the battery and load via the Battery and Load terminals on the rear panel.

3. Connect (if needed) the Extension and DC Distribution units. **Pay special attention to the polarities of the wires and locations.**

4. Insert a rectifier module into the main unit. All compartments are similar and connected in parallel.

5. Use $16mm^2$ (5 AWG) wires for the AC terminals. **Minimum requirement is $8mm^2$ (8 AWG)**

6. AC source must be current limited (50A) using an external circuit breaker.

7. Plug the AC input cord into the AC source.

8. Turn on the Line circuit breaker, and verify that the system controller is activated.

9. Insert the other rectifiers, and verify all green LED's on the panels are lit.

10. All parameters such as the output voltage are pre-defined in the factory.

11. Connect the temperature sensors to the appropriate connector at the rear panel of the main unit. Place the sensors in the battery compartment.

12. Switch on the *LOAD* and *BATTERY* circuit breakers. Verify that the *BYPASS* breakers are off.

    The system is now ready for use.

13. Verify that the *FAULT* red LED is not lit and the buzzer not active.

14. Connect a PC to the RJ-45 port at the front panel of the main unit to control the system (optional).

Figure 7-6: BSPS Main Rack front view

Protective covers

Figure 7-7: Rear BSPS cable connections

7.3.1. Connecting Power to BSDUs

The BSPS's DC Distribution unit provides circuit breakers for distributing power output to BSDUs housed in the WipLL cabinet.

The DC Distribution unit contains a switch that provides an LVD circuit bypass option. When this switch is activated the battery is no longer protected against deep discharge and the system controller alarm is then activated.

The distribution rack is provided with front panel and rear panel terminations for connecting to the BSPS main power rack.

To connect the BSPS DC power supply to the BSDU:

1. Attach the shielded power cable connector (supplied) end that contains the wire for preventing power radiation, to the BSDU's power port—labeled **POWER - 48 VDC**. Ensure that the black-colored (i.e., negative) half of the connector is positioned at the top and the red-colored (i.e., positive) half at the bottom.

Screw for power cable
radiation immunity
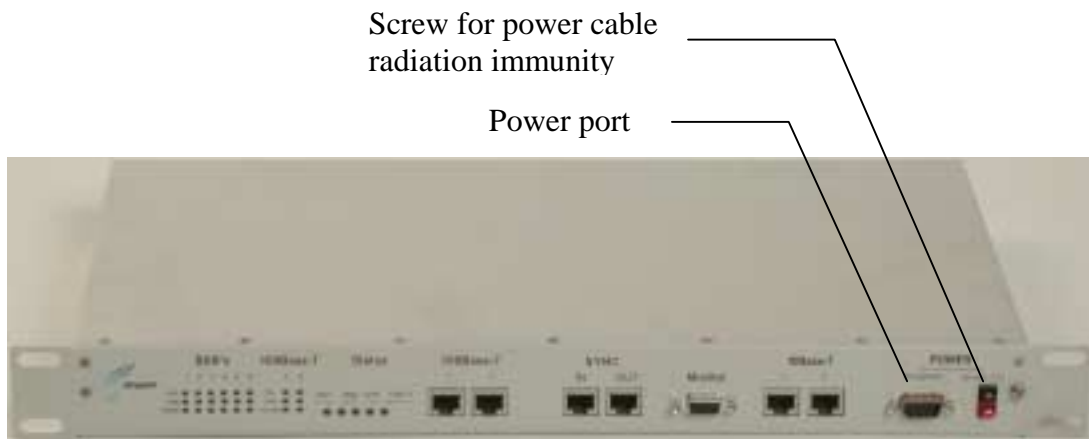
Power port

Figure 7-8: BSDU front panel with power port and screw attachment for power radiation immunity

2. Connect the power cable's yellow/green lug wire, for radiation immunity, to the BSDU chassis by using the screw attachment located alongside the power port, as displayed in Figure 7-8.

3. Connect the other end of the power cable to the DC output port of the BSPS's DC Distribution unit (labeled **LOAD**).

The rack front panel is shown in Figure 7-9.

DC power connections
to BSDUs
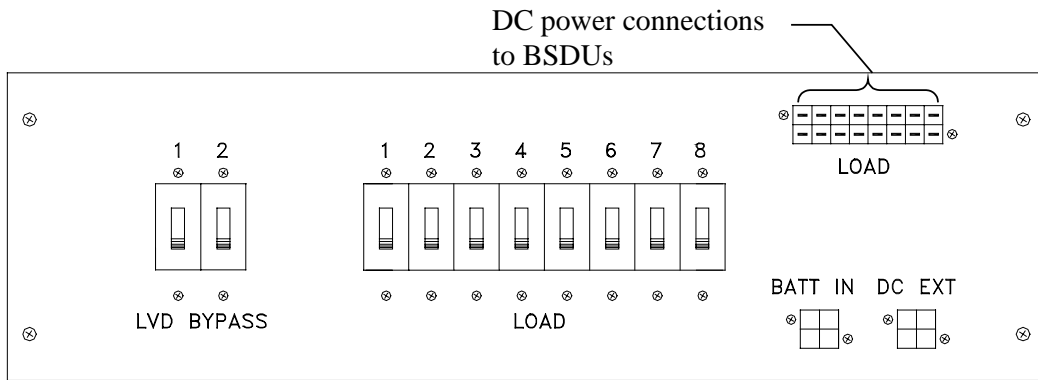
Figure 7-9: DC Distribution Rack front view

- **LOAD DC**—DC connection to BSDUs

- **DC EXT**—extension rack DC power input connection

- **BATT IN**—battery input connection

- **LVD BYPASS—**bypass circuit breakers

- **LOAD**—load circuit breakers

The rack rear panel is shown in Figure 7-10.

Figure 7-10: DC Distribution Rack rear view

■ **LVD BYPASS**—LVD bypass input connection from main rack

■ **COMM**—Main/Extension Rack Communication port

7.3.2. Installing the Rectifier

The Rectifier module is the heart of the Full-Redundancy 48 VDC power system. It converts the input AC to DC current. The Rectifier is a plugged-in module designed specifically for modular systems. The BSPS can house up to three basic rectifiers.

To install a rectifier in the BSPS system:

1. Remove the blank panel from where you want to install an additional rectifier in the rectifier shelf.

2. Insert the rectifier into its place with the upper and lower slides.

3. Secure the rectifier in place with 4 screws in the front panel.

4. Verify that the **ON** LED is lit.

5. If there is a load on the BSPS system, verify, via the Load Bar, that there is current sharing in the BSPS system by the rectifier.

7.3.3. Calibrating the Rectifier

The output current indication is indicated by an LED bar graph shown on the unit front panel. This bar graph is used to verify current sharing operation between modules fitted in the rack, and to indicate the percentage of the full load.

Bar graph

On LED indicator
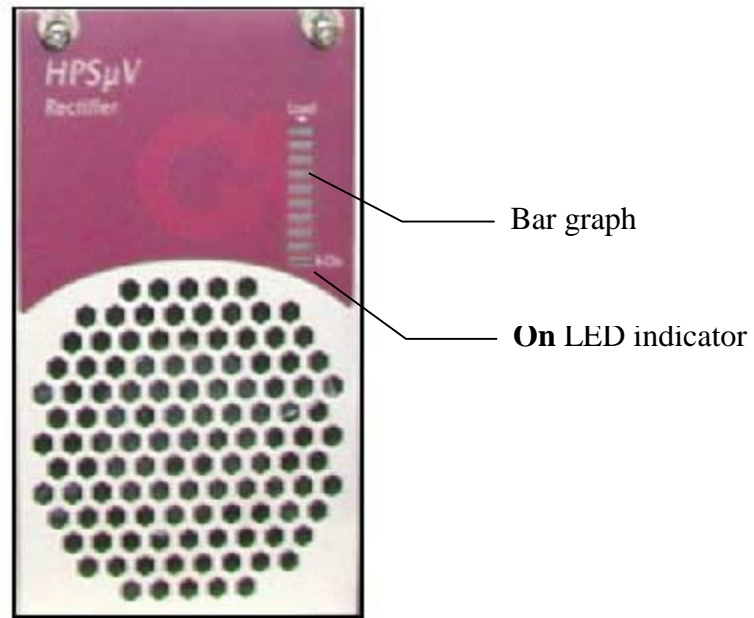
Figure 7-11: Rectifier module front view

The calibration of the Rectifier module is simple and involves a single trimmer-potentiometer that adjusts the output voltage.

To calibrate the rectifier:

1. Remove the rectifier from the unit.

2. Connect the Share (+) bus to the negative pole (-) of the rectifier.

3. Using a DMM set the output voltage to 53.50 VDC.

4. Check the single rectifier using a female connector (such as the one used in the units of the system).

    Or

5. Perform provisions for the calibration on a dedicated unit.

6. Access the trimmer via the small opening at the back of the cover.

7.3.4. Operating the System Controller

Figure 7-12 shows the features provided on the front panel of the system controller module.

8-pin RJ-45 port
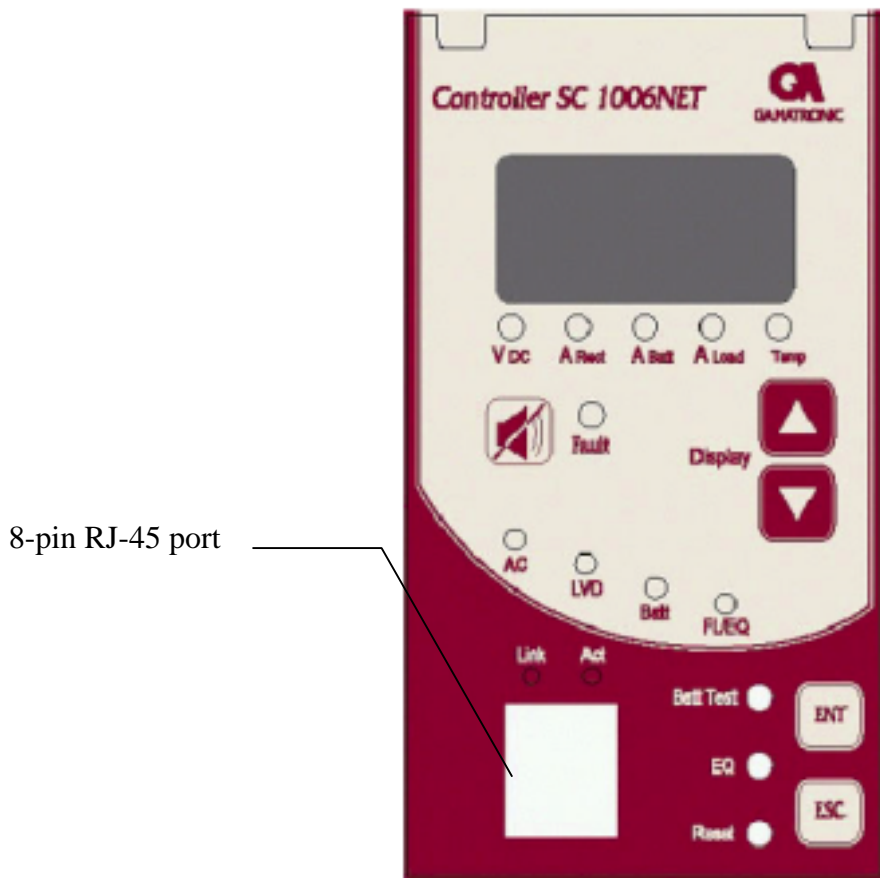
Figure 7-12: System controller front panel

The function of the LED's provided on the System controller module can be defined as follows:

LED	Color	Meaning
AC	Green	Input AC voltage is normal
DC	Green	Output DC voltage is normal
LVD	Red	State of the Low Voltage Disconnect circuit: red indicates that the battery is disconnected
BATT	Green	Battery test has passed
FAULT	Red continuous	General fault alarm
	Red blinking	Faulty rectifier detected

The following lists the buttons and their functions on the System Controller module.

Button	Function
BATT TEST	This is a manual battery test button. A pencil tip may be used to activate.
ALARM OFF	This button silences the module internal buzzer. A pencil tip may be used to activate.
RESET	This button resets the module. A pencil tip may be used to activate.

7.4. Connecting the BSPS Management Cables

Connecting the BSPS's System Controller module to the WipLL BSDU provides the user with the ability to control the power system operating parameters, retrieving system data, and status information.

The BSPS System Controller connects to the BSDU(s) via an RJ-45 port located on the front panel of the controller module. This is connected to BSDU's 9-Pin D-type port, labeled **POWER Management**.

■ **Connectors:**

  ■ **BSPS**: 8-pin RJ-45 (or for previous BSPS models, a 9-Pin D-type)

  ■ **BSDU:** 9-pin D-type female

■ **Connector pinouts:**

  ■ BSPS's 8-Pin RJ-45:
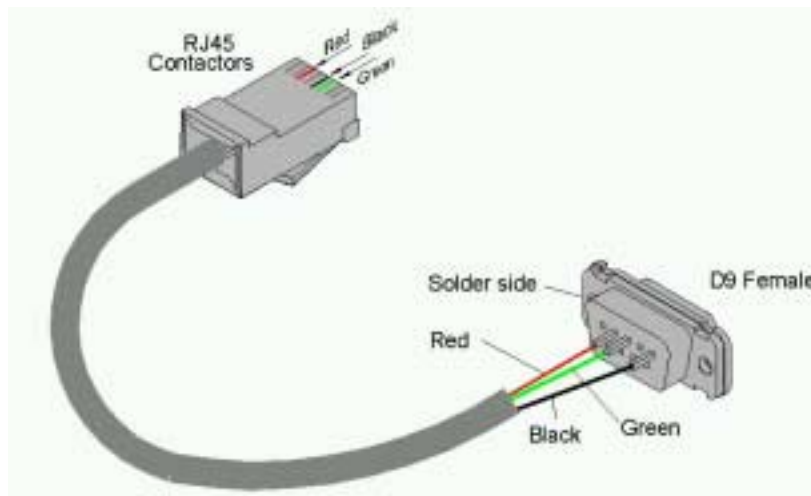
Figure 7-13: BSDU-to-BSPS management connectors via RJ-45 (BSPS) to 9-Pin D-type (BSDU)

  ■ BSDU's 9-pin D-type:

```
   COM              Tx    Rx
```
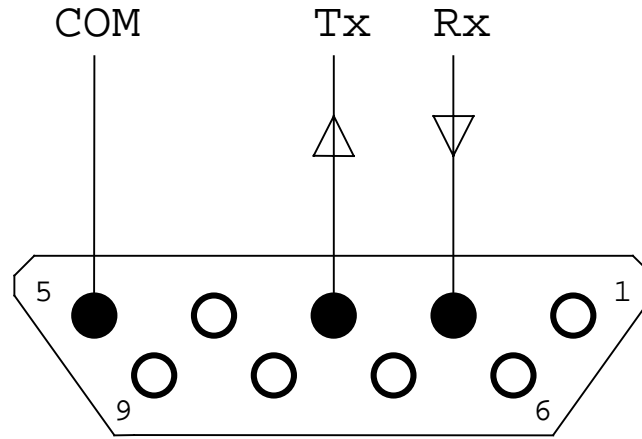
Figure 7-14: BSDU's 9-pin D-type Connector Pinouts

Note: See Chapter 5, "Installing the BSDU" for detailed connector pinouts.

7.4.1. BSPS Troubleshooting

The table below indicates methods of solving problems that may arise during the BSPS installation process.

BSPS troubleshooting tips

Symptom	Possible Cause	Remedy
FAULT LED is blinking	One or more rectifier modules are faulty	Replace the faulty rectifier/s
FAULT LED is on	• Any breaker is left open • Abnormal input or output voltages • Over temperature • LVD is open • Battery test failed	• Check all breakers • Check line voltage and load, rectifiers may be over-loaded • Check the temperature sensor • Check the line, general check • Check the battery breaker, cables and replace battery if none of this helps

Symptom	Possible Cause	Remedy
No backup time when AC is absent	Battery is not connected Battery is discharged or power is low.	Check battery charge, connections and circuit breaker
Load is not operating	Load is not connected	• Check load cables. • Check load circuit breaker.
No current sharing among rectifiers (more then 2 segments difference between any two modules).	• Load is too high. • Extension rack is not properly connected to the main rack. • Rectifier(s) are not properly adjusted.	• Decrease the load or add rectifiers to the system. • Check connections. • Re-adjust the voltage of the problematic rectifier(s).
Battery backup time is too low	• Battery is too small for the application. • Charging voltage is too low • Weak battery	• Increase battery capacity • Raise the system output voltage using the "VOLT ADJ." • Replace the battery and check ambient temperature according to manufacturer's instructions

7.5. BSPS Cabinet Cabling

This section defines the procedures to be adhered to when installing data cables in the BSPS cabinet.

> **Note:** A minimum separation of 200 mm should exist between power and data cables.

■ Cable access apertures are located in the top surface of the cabinet. Separate apertures are provided for power and data cables. All cabling entering and exiting the BSPS cabinet shall be protected using flexible conduit and gland systems suited to the cabinet. Power and data cables should exit from the BSPS cabinet via separate apertures.

■ Data cables are to be secured to cable guides provided on the left-hand side of the cabinet when viewed from the rear. Cables are to be brought together to a

point on the cable guide from where they can be fanned out and fed to the Base station Distribution Units (BSDU's).

■ Data cables terminating at the front of the BSDU's should be fed through the brush gland fitted adjacent to the units and secured to the cable management bar using tie-wraps.

■ When cabling the BSPS cabinet consideration should be given to future growth and expansion. Allowances in cable forms should be made for the removal of equipment for maintenance, i.e., BSDU's, Power racks etc.

■ Where cables are installed but not connected to equipment they should be tied off in such a way as to prevent damage, allow for future growth and maintenance. Pre-terminated cables should be treated with care and should not be laid out in vulnerable areas where they may be susceptible to damage.

■ Cable crossovers should be kept to a minimum to prevent system interference and allow easy equipment removal.

■ Ensure that the cables are dressed in such a fashion that they are not exposed to hot exhaust air, sharp edges, doors etc.

■ Observe recommended minimum bend radii when installing copper cables. Wherever a cable changes direction, ensure that it does so in a smooth curve with a radius of at least 50mm in order to prevent damage.

■ Cables shall be secured directly to cabinet cable trays with plastic cable ties. Secure the data and power cables at regular intervals within the cabinet to the cable management trays/trunking provided using cable ties. These ties should be tensioned and cut using the supplied tool 1PAC10370ACK.

■ Care is to be taken to ensure that cables providing connection to peripheral equipment (e.g. PC's) do not pose a trip hazard.

■ WipLL system interface cables providing connection to a network shall be terminated and presented to a digital distribution frame (DDF) as agreed with the customer. Dressing of cables at the DDF shall be done to ensure a potential trip hazard is not created.

■ All data cables should be labeled with both the source and destination at each end. Un-used cable ends must also be identified with labels to assist with future upgrades.

7.5.1. BSPS Cabinet Grounding

Warning: The WipLL BSPS cabinet must be connected to the customers building common earth point (CEP) earth before connecting AC power supplies and installing any equipment.

■ When the BSPS cabinet has been located an earth cable shall be run from the building common earth point (CEP) to the primary earth stud of the cabinet.

■ Earth cable specification is to be 6mm^2. Cable color-coding is to comply with local regulations.

■ Crimp M6 x 6mm^2 lug to the end of the cable to be attached to the CEP with crimp tool 'BMR 16U3' (Airspan Code 1PAC10336AED).

■ The required length of cable is to be measured back to the cabinet earthing stud and the excess removed.

■ Crimp M6 x 6mm2 lug to the cable end to be attached to the cabinet earth stud using crimp tool 'BMR 16U3' (Airspan Code 1PAC10336AED).

■ Attach the earth cable to the CEP using fastenings provided.

■ Attach the earth cable to the cabinet primary earth stud using the fastenings provided.

7.5.2. BSPS Equipment Supplementary Grounding

■ Equipment housed in the BSPS cabinet must be supplementary grounded by connecting a ground lead between each unit ground stud and the cabinet primary ground stud.

■ Cable specification is to be 2.5 mm^2. Cable color-coding is to comply with local regulations.

7.5.3. BSPS Cabinet Power Requirements

The following section describes the BSPS cabinet mains power requirements.

> **Warning:** The following information assumes a fully populated BSPS cabinet with main and extension power racks fitted.
>
> Cable sizes and electrical circuit protection devices discussed in the following section are typical for 230 Volt AC circuits only. Adjustments are required for other applications.

■ Within the BSPS cabinet protected AC mains feeds are required for the main power rack and two power outlets.

■ Both power outlets are to be installed within the cabinet on an independent radial circuit. Sockets are to be used for the connection of ancillary test/commissioning equipment only. The type of socket used is dependant on local electrical requirements.

■ Power within the BSPS cabinet is to be distributed from a modular AC consumer unit fitted with a 100 amp DP isolator. The unit is to be a metal-clad type with sufficient outputs for services in the cabinet.

■ The following tables displays the protective device rating and cable specification required for each element of the cabinet AC circuit.

Service	Fuse Rating	Cable Spec
Cabinet power input	32 amp	6 mm^2
Main rack input	16 amp	2.5 mm^2
Extension rack link	N/A	2.5 mm^2
Power socket No.1	6 amp	1.5 mm^2
Power socket No.2	6 amp	1.5 mm^2

■ Provision is made on the rear of the BSPS main power rack for the AC power connection. A terminal block is provided for the link to the extension power rack when fitted.

■ A terminal block is provided on the rear of the power extension rack for the link from the main power rack.

■ When connecting racks to the AC mains supply loosen the grub screws on the terminal blocks. Insert the bare copper conductor ensuring correct polarity. Firmly tighten the screw and gently pull on each cable to ensure the grub screw has made full contact. Ensure that bare wires are not exposed.

■ The plug fitted to the BSPS cabinet power input cable is to be compatible with the socket provided in the customers' premises. It must comply with local regulations for connection of products with earth leakage exceeding 3.5 mA.

■ Once AC power connections to the power racks are completed fit protective covers over the terminal blocks as shown in Figure 7-15.

Figure 7-15: Fitting protective covers over terminal block

■ Power cables are to be routed in the cable guide down right-hand side of the BSPS cabinet (when viewed from the rear).

■ Secure cables in position using strategically located cable ties.

■ Power cables external to the BSPS cabinet must be housed in trunking. The trunking is to be secured to the wall of the equipment room. Type, securing method and route of trunking is to be in accordance with customers' requirements.

■ A minimum separation distance of 200 mm is to be maintained between AC and DC/signaling cables when they run parallel to each other. However these cables may cross each other at right angles.

■ Any dust/debris created during the installation of electrical equipment or cables shall be cleared and correctly disposed of as the installation progresses.

Part II

Installing WipLL Customer Premises Equipment

Part II describes the procedures for installing the WipLL equipment located at the subscriber's premises.

Part II includes the following chapters:

■ Chapter 8, "Installing the Subscriber Premises Radio (SPR) and Subscriber Data Adapter (SDA)"

■ Chapter 9, "Installing the Indoor Data Radio (IDR)"

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8

Installing the SPR

This chapter describes the installation of the WipLL **Subscriber Premises Radio** (SPR) at the subscriber's premises.

This chapter includes the following chapters:

■ Overview

■ Physical Dimensions and Basic Design

■ Cable Guidelines

■ Mounting the SPR

  ■ Minimum Distance between SPRs

  ■ Wall Mounting

  ■ Pole Mounting

■ Connecting to an External Third-Party Antenna (Optional)

■ Connecting to a PC for Initial Serial Configuration

■ Connecting to the SDA

■ Connecting to a Power Supply

8.1. Overview

The SPR receives and transmits data from and to the base station. The SPR connects to the subscriber's network through the SDA. The SDA is an Ethernet hub/LAN switch that provides the SPR with DC power, lightening protection, and Ethernet connectivity to the subscriber's PCs/network. The SPR connects to the SDA by a CAT-5e cable.

The SDA provides 10/100BaseT connectivity (depending on the SDA model) to the subscriber's PCs or network (up to four PCs depending on SDA model).

The SPR is typically mounted on the subscriber's roof or external wall The SDA is located inside the subscriber's premises.

The SPR is available in three models:

■ **SPR with Standard Gain:** includes a built-in antenna 15/16-dBi antenna gain, covering an area of 23 degrees

■ **SPR with High-Gain Antenna:** includes a built-in antenna with an 18-dBi antenna gain, covering 15 degrees.

■ **SPR with external antenna:** includes an N-type connector port for attaching a third-party external antenna.

Figure 8-1 displays a typical setup of the SPR and SDA at the subscriber's premises.

> **Note:** The SDA can also be installed at a base station that has only one BSR. This SDA replaces the need for the BSDU, and provides power and connectivity to the single BSR.
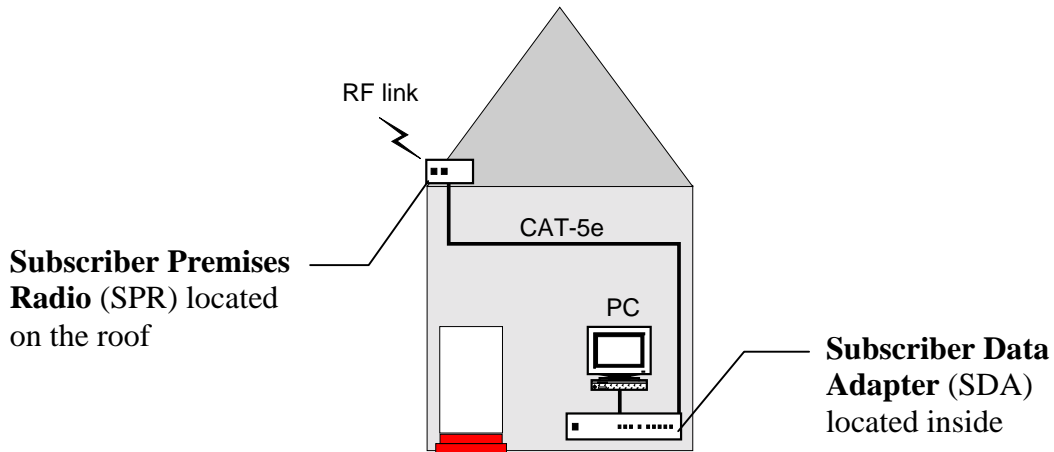
Figure 8-1: Typical SPR and SDA location and connections at subscriber's premises

Warning: As the system emits microwave radiation, a minimum distance of 200 mm must be maintained from the front of the SPR.

To avoid electrical or fire hazard, connect the SPR to the power supply only after mounting the SPR and connecting data cables between the SPA and SDA units.

Note: Usually, the SPR is initialized (i.e., configured with an IP address) at Airspan's factory. However, if the SPR has not been configured, see Section 8.6, "Connecting to a PC for Initial Serial Configuration", before mounting the SPR.

8.2. Physical Dimensions and Basic Design

The SPR is encased in a chassis and provides access to the SPR's communication port at the front panel. The SPR's bottom panel provides holes for mounting the SPR to, for example, a pole or wall (see Figure 8-3).

15-pin D-type port

Figure 8-2: SPR (internal antenna model)
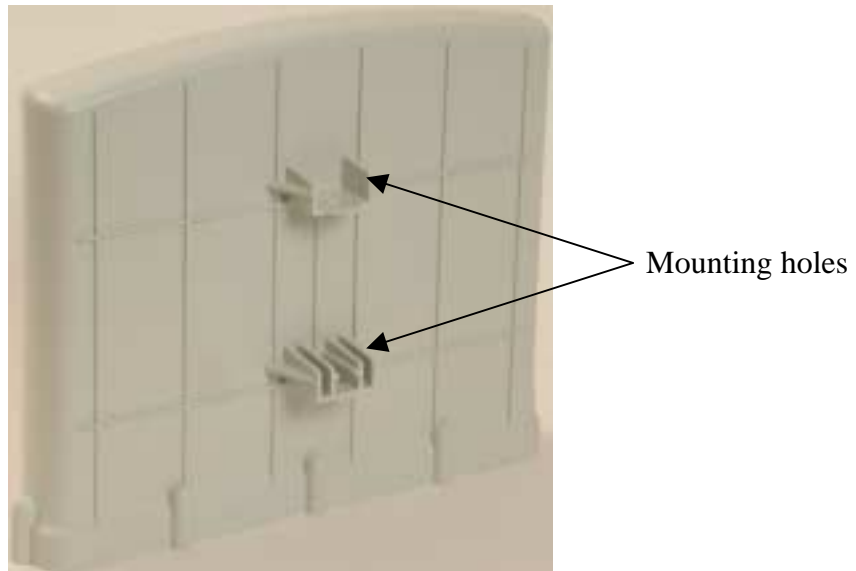
Mounting holes

Figure 8-3: SPR bottom panel providing holes for mounting

The SPR's physical dimensions are described in Table 8-1

Table 8-1: SPR Physical Dimensions

Parameter	SPR model	
	Standard Gain Antenna	**High Gain Antenna**
Height	311 mm (12.24 inches)	400 mm (15.74 inches)
Width	224 mm (8.82 inches)	317 mm (12.48 inches)
Depth	65.5 mm (2.58 inches)	65.5 mm (2.58 inches)
Weight	2.5 kg	4.7 kg

Note: The SPR's physical dimensions exclude the mounting kit.

8.3. Cable Guidelines

The following lists cable installation guidelines at the subscriber's premises:

■ To prevent tripping, wiring channel is to be provided at the subscriber's premises to house data cables. Wiring channel type, location, and methods of securing are to be discussed with the subscriber.

■ Cables not housed in wiring channel must be dressed in a manner to avoid a trip hazard. Avoid trailing wires across passageways.

■ External data cables are to be protected in metal conduit that is to be secured to the building structure in accordance with manufacturers recommendations.

■ Outside wiring channels must not be located as to cause a trip hazard (e.g. roof walkways)

■ Observe recommended minimum bend radii when installing copper cables. Wherever a cable changes direction, ensure that it does so in a smooth curve with a radius of at least 50 mm in order to prevent damage.

■ A maintenance loop is to be left in the cable just before the cable reaches the SPR to prevent strain on the connector.

■ Data cables threaded into holes drilled in walls are to be covered by a waterproof sheath to prevent water penetration.

■ Silicone sealant should be used to plug any holes on both internal and external wall surfaces once cables are in place.

■ All data cables should be labeled with both the source and destination at each end.. Un-used cable ends must also be identified with labels to assist with future upgrades.

Warning: Cables with exposed ends (i.e., not yet crimped) should be covered with protective polythene bags during external cable installation processes.

Note: A minimum separation of 200 mm should exist between power and data cables.

8.4. Mounting the SPR

The SPR can be mounted on a wall or pole (see Figure 8-9). The SPR is mounted using the mounting holes located on the SPR's bottom panel, and the mounting bracket (provided). The mounting brackets for wall- and pole-mounting are different from one another.

The following is a list of physical parameters that should be considered before mounting SPRs:

8.4.1. Minimum Distance between SPRs

A minimum of 3-meter separation is required between mounted SPRs and existing customer radio equipment when not transmitting on the same sector (see Figure 8-4).
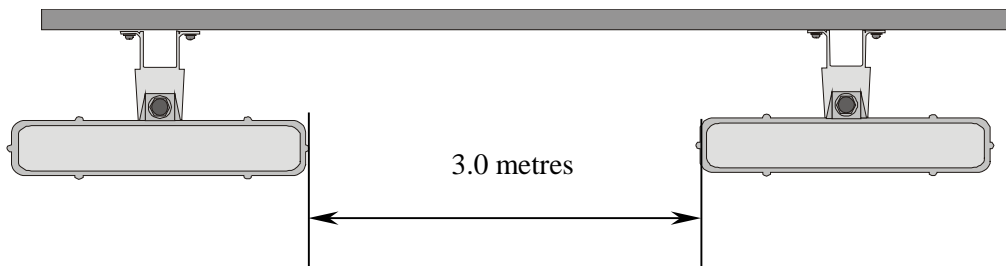
Figure 8-4: SPR separation when not transmitting on the same sector

A 1-meter separation is required between SPRs when on the same sector and transmitting to the same BSR without requiring shielding (see Figure 8-5).
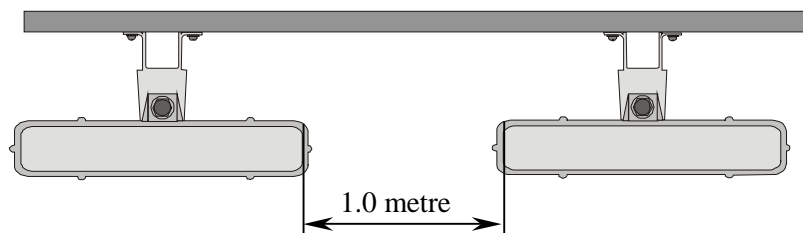
Figure 8-5: SPR separation when transmitting on the same sector to the same BSR

8.4.2. Wall-Mounting

SPR wall mounting is performed in two chronological stages:

- Attaching the mounting bracket to the SPR's mounting holes.

- Attaching the mounting bracket (attached to the SPR) to the wall.

To mount the SPR on a wall:

1. Attach the mounting bracket to the SPR using two stainless steel bolts, as shown in Figure 8-6.
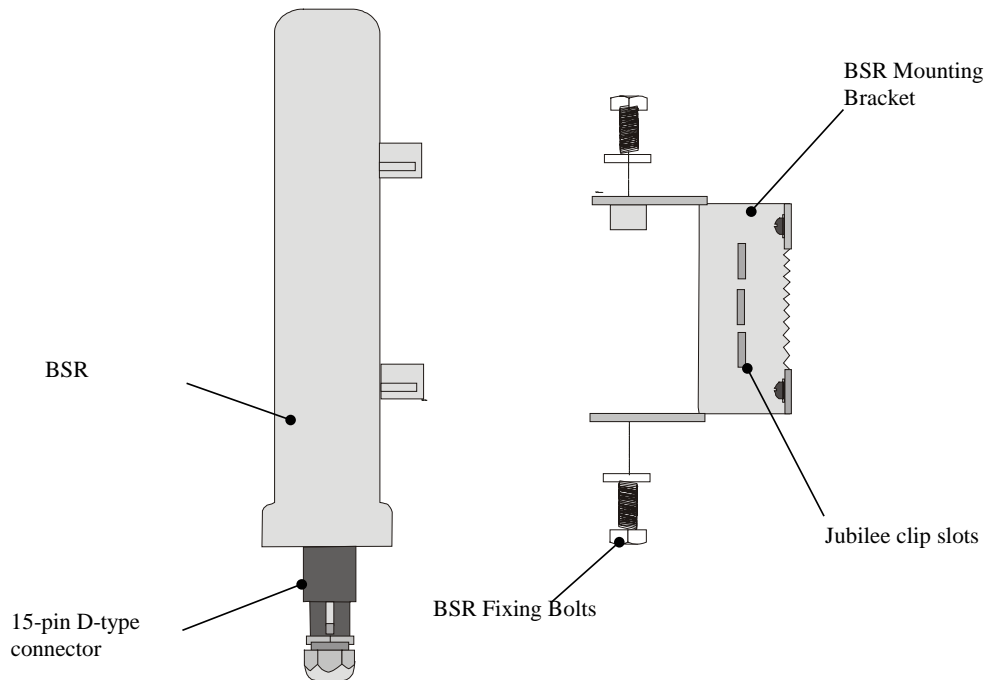
Figure 8-6: Attaching the mounting bracket to the SPR

2. Attach the mounting bracket to the wall using four screws. The fixing dimensions for the mounting bracket is illustrated in Figure 8-7.
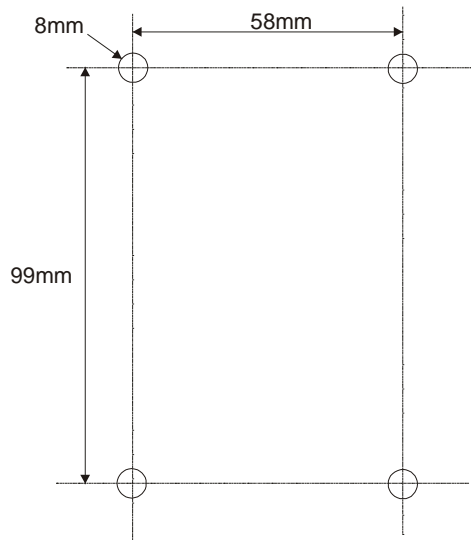
Figure 8-7: SPR mounting bracket dimensions for the four fixing holes

Note: Airspan does not provide screws for attaching the mounting bracket to the wall. The screw size depends on the structure of the building to which the bracket is to be attached. When selecting screw sizes, consideration must be given to the weight of the SPR and load that may be induced in windy conditions.

3. Adjust the horizontal positioning of the SPR, and then fasten tight the two stainless-steel bolts.

    Rotation is restricted to the horizontal plane only. The permissible rotation is shown in Figure 8-8.
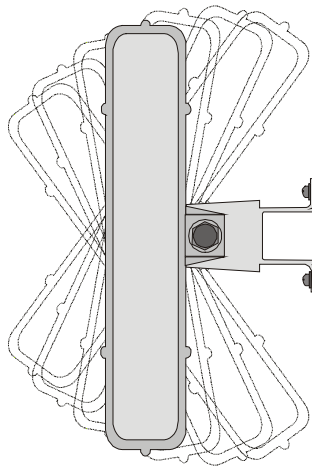
Figure 8-8: Horizontal rotation of the SPR

Note: A thread-locking compound is to be used to prevent the bolts working loose.

8.4.3. Pole-Mounting

The SPR can be mounted on a pole (see Figure 8-9). Pole mounting allows the SPR to be adjusted in the horizontal as well as the vertical plane. The pole-mounting bracket assembly is designed to support the SPR on a round pole of 45 mm in diameter.

Figure 8-9: Mounted SPR

To mount the SPR on a pole:

1. Attach the mounting bracket to the SPR using two stainless steel bolts.
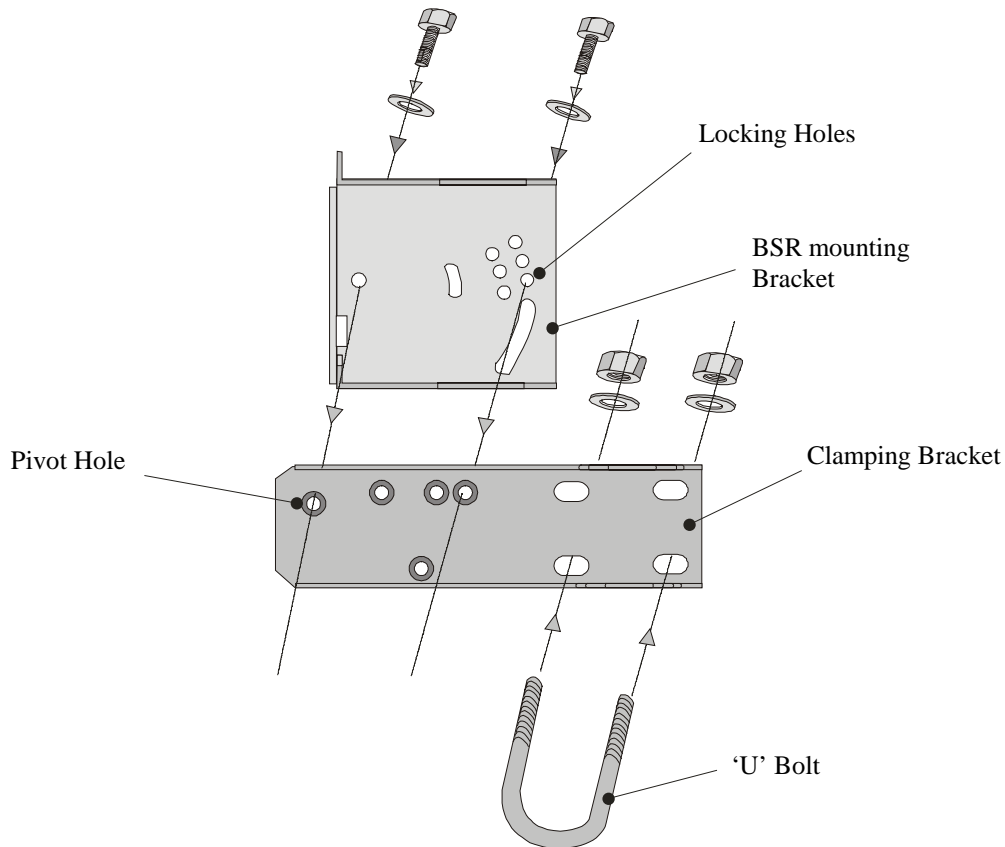
Figure 8-10: SPR mounting bracket assembly

2. Attach the clamping bracket to the mounting bracket using two M8 stainless bolts.

3. Attach the Clamping bracket to the pole by placing the U-bolt around the pole, and then inserting the U-bolt through the Clamping bracket and securing it by screwing the two bolts on the U-bolt.

4. Adjust the vertical position of the SPR. Lock the SPR at the desired position by inserting the locking bolt in the desired position. Once the correct angle has been set both bolts must be tightened to lock the SPR bracket in place.

5. Adjust the horizontal position of the SPR by rotating the SPR about the pole, and then tighten the U-bolt.

    SPR positioning is obtained in two planes by adjustment of the mounting bracket assembly a shown in Figure 8-11.

Rotation about the
mounting bracket

Rotation about the
mounting pole
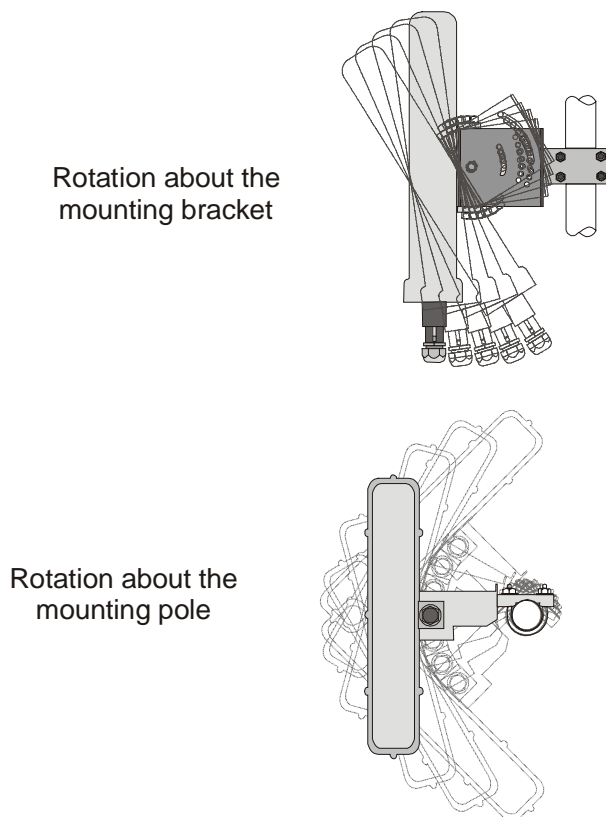
Figure 8-11: SPR GPS orientation in vertical (top figure) and horizontal plane (lower figure)

Note: A thread-locking compound is to be used to prevent the bolts working loose. A loop should be left in the cable for maintenance purposes and to prevent the cable weight being taken directly on the connector.

8.5. Connecting an External Third-Party Antenna (Optional)

The SPR model with an N-type connector can be connected to an external antenna. The addition of an external antenna allows greater RF sector coverage than the standard SPR internal antenna models (i.e., 60°).

■ **Connector:** N-type male

Figure 8-12: Example of an N-type connector

■ **Cable:** RF

To connect the SPR to an external antenna:

1. Attach the **N-type male** connector to the N-type receptacle located on the SPR's front panel.

2. Attach the other end of the cable to the external antenna.

N-type connector

Figure 8-13: SPR model with N-type connector for attaching an external antenna

> **Note:** Airspan supplies unterminated cables for N-type connectors. Refer to Appendix B, "Cable Crimping" for N-type cable crimping.

8.6. Connecting to a PC for Initial Serial Configuration

To configure an SPR, you need to connect a PC running the WipLL network management system (WipConfig) to the SPR. The SPR's 15-pin D-type port provides serial interface to a PC for SPR initial configuration. This port uses 9 of its 15 pins for serial interface; the remaining pins are used for interfacing with the SDA with which the SPR remains connected. To connect the SPR to the management station (i.e., PC) and the SDA, a Y-cable (splitter) is used.

Note: SPR configuration is performed while the SDA is connected to the SPR.

The SPR-to-PC and SDA cable connections for SPR serial configuration are as follows:

■ **Connectors:**

- ■ **SPR:** 15-pin D-type male (only 9-pins used)

- ■ **PC:** 9-pin D-type (RS-232)

- ■ **SDA:** 15-pin D-type male

■ **Cable:** straight-through Y-cable
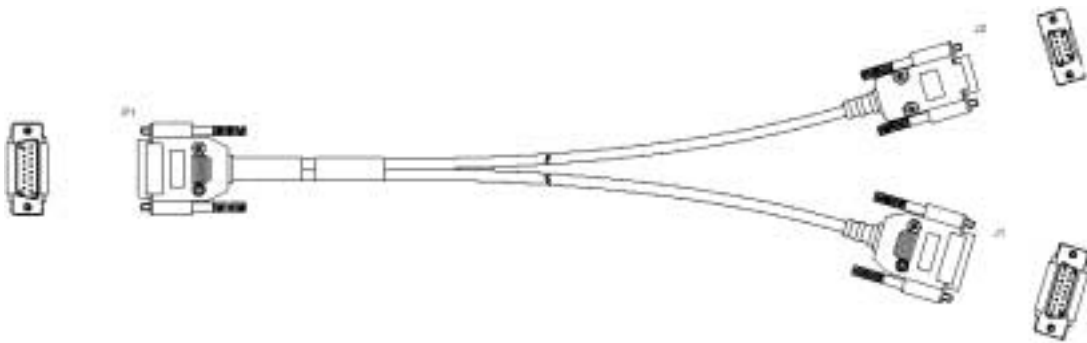
Figure 8-14: Y-Cable (P1 for SPR; J1 for SDA; J2 for PC's serial port)

■ **Connector pinouts:** Table 8-2 displays the connector pinouts for the 15-pin D-type connectors at the SPR and SDA, and the 9-pin D-type connector at the PC management station.

Table 8-2: Y-cable connector pinouts for SPR-to-PC serial cable connection

SPR (15-pin D Type) P1		SDA (15-pin D Type) J1		PC (RS-232) J2	
Pin	**Function**	**Pin**		**9-Pin**	**Function**
1	0 VDC	1	0 VDC	1	
2	+48 VDC	2	+48 VDC	2	Tx
3	Ethernet Tx+	3	Ethernet Tx+	3	Rx
4	Ethernet Tx-	4	Ethernet Tx-	4	
5	Ethernet Rx+	5	Ethernet Rx+	5	GND
6	Ethernet Rx-	6	Ethernet Rx-	6	
7	Hop Sync+	7	Hop Sync+	7	
8	Hop Sync-	8	Hop Sync-	8	
9	NC	9	NC	9	
10	NC	10	NC		
11	NC	11	NC		
12	NC	12	NC		
13	NC	13	NC		
14	RS232 Rx	14	NC		
15	RS232 Tx	15	NC		

The Y-cable connector pin assignments is displayed in Figure 8-15.

Figure 8-15: Y-cable connector pin assignment

To connect the SPR to the PC and SDA for serial configuration:

1. Connect the **15-pin D-type male** connector (P1), at the one end of the Y-cable, to the SPR, as displayed in Figure 8-16.

2. Connect the **15-pin D-type male** connector (J1), at the other end of the Y-cable, to the SDA, as displayed in Figure 8-16.

3. Connect the **9-pin D-type** (RS232) connector (J2), at the other end of the Y-cable, to the PC, as displayed in Figure 8-16.
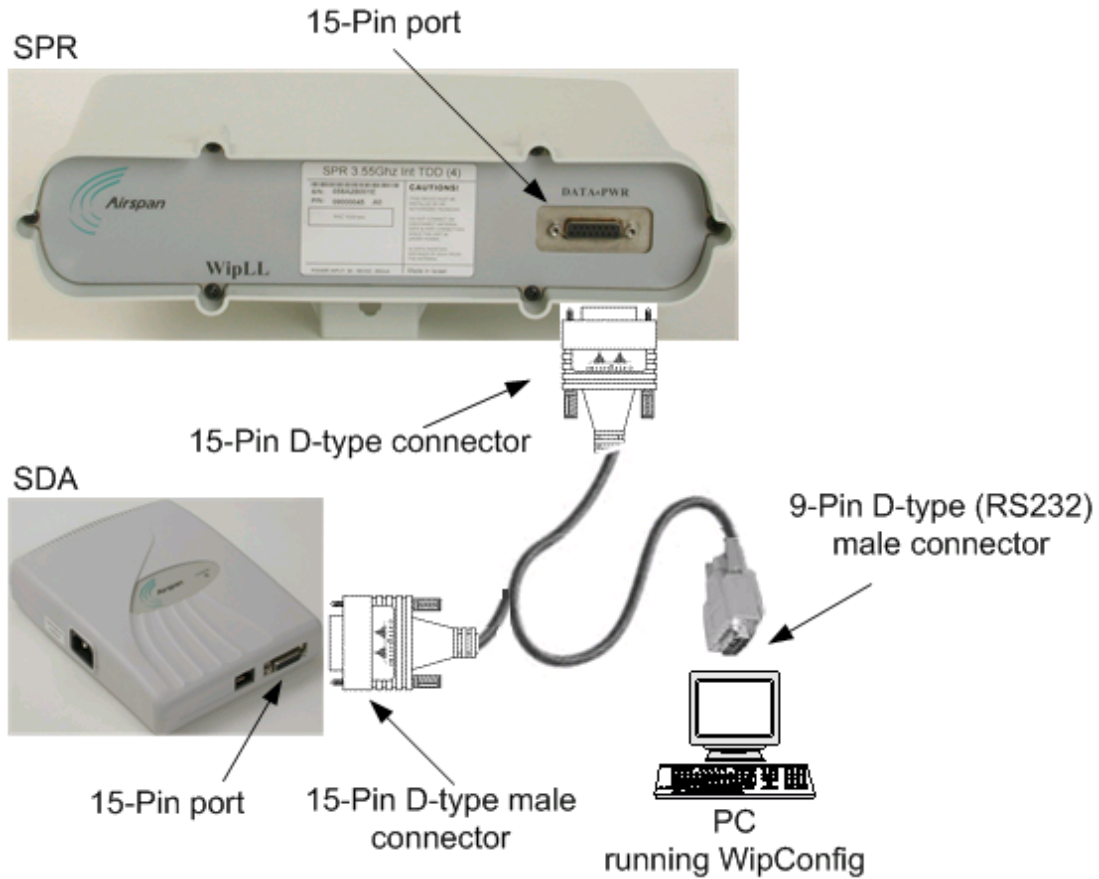
Figure 8-16: SPR cable connections for serial configuration

Note: For performing SPR initial configuration using WipLL's management applications, refer to Airspan's *WipConfig User's Guide* or *WipConfig PDA User's Guide*.

8.7. Connecting to the SDA

The SPR connects to the subscriber's PCs/network through the SDA. To connect the SPR to the SDA, you need to connect the SPR's 15-Pin D-type port to the SDA's 15-pin D-type port by a CAT-5e cable.

The SPR-to-SDA cable connection configurations is as follows:

■ **Connectors:**

- **SPR:** 15-pin D-type male (only 8 pins are used)

- **SDA:** 15-pin D-type male (only 8 pins are used)

Note: Airspan supplies unterminated CAT-5e cables. Refer to the cable crimping procedures for 15-Pin D-type connectors detailed in Appendix B, "Cable Crimping".

■ **Cable**: straight-through 10Base-T Ethernet UTP 4 Pair **CAT-5e** outdoor type (24 AWG)

■ **Connector pinouts:**

- **SPR:**

15-Pin D-type	
Pin	**Function**
1	+ 48VDC
2	- 48VDC
3	+Tx
4	-Tx
5	+Rx
6	-Rx
7	+Sync.
8	-Sync.
9	Not connected (NC)
10	NC
11	NC

15-Pin D-type	
Pin	**Function**
12	NC
13	NC
14	NC
15	NC

■ **SDA:**

SDA-1, SDA-4H, SDA-4S (15-Pin D-type)	
Pin	**Function**
1	+48v
2	-48v
3	+RX
4	–RX
5	+TX
6	–TX
7	Not connected (NC)
8	NC
9	NC
10	NC
11	NC
12	NC
13	NC
14	NC
15	NC

Note: The SDA connector pinouts are the same for all SDA models (SDA-1, SDA-4H, SDA-4S, SDA-4S/VL, SDA-4S/1H3L, and SDA-4S/VL/1H3L).

> **Warning:** To avoid electrical shock, before connecting the SPR to the SDA, ensure that the SDA is not connected to the power supply.

To connect the SPR to the SDA:

1. Attach the **15-pin D-type** connector, at one end of the cable, to the SPR's 15-pin D-type port labeled **DATA POWER SYNC**, as displayed in Figure 8-17.

2. Attach the **15-pin D-type** connector, at the other end of the cable, to the SDA's **15-pin D-type** port, as displayed in Figure 8-17.
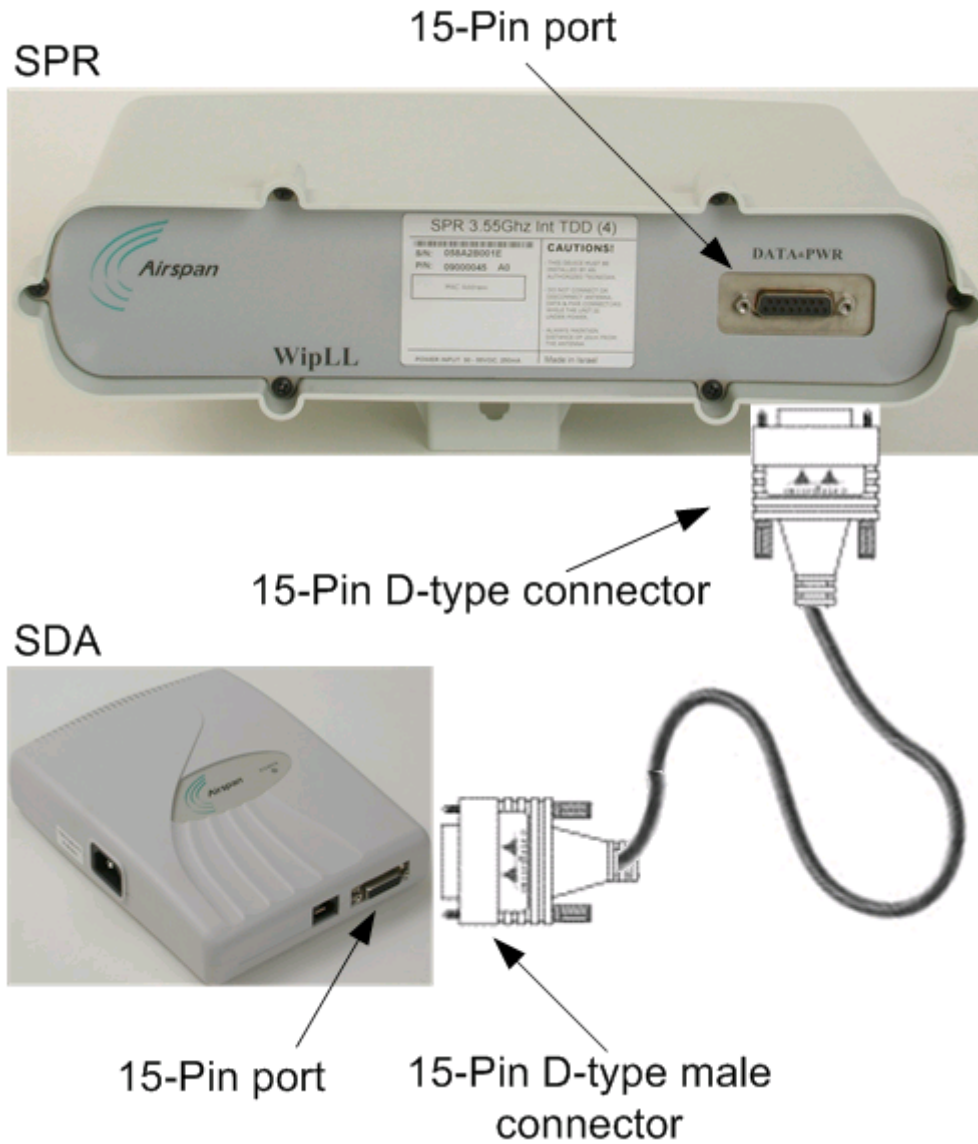
Figure 8-17: SPR-to-SDA cable connections

Note: The maximum cable length permissible between the SPR and SDA is 100 meters.

8.8. Connecting Power

The SPR receives, through its 15-pin D-type port, its power supply from the SDA. In turn, the SDA connects to an external power adapter from where it receives power. The SDA provides 48 VDC nominal power to the SPR (minimum of 30 VDC: maximum of 55 VDC).

> **Note:** For a description of the procedure for connecting power to the SDA, see Chapter 9, "Installing the SDA".

Installing the SDA

This chapter describes the installation of the WipLL **Subscriber Data Adapter** (SDA) at the subscriber's premises.

This chapter includes the following chapters:

■ Overview

■ Physical Dimensions and Basic Design

■ Mounting the SDA

 ■ Desktop-Mounting

 ■ Wall-Mounting

■ Connecting to the SPR

■ Connecting to the Subscriber's Ethernet Network

 ■ Connecting to PCs

 ■ Connecting to a Hub

 ■ Connecting to a VoIP Network

■ Connecting AC Power

■ LED Display

 ■ SDA-4H

 ■ SDA-4S Models

9.1. Overview

The SDA is an Ethernet hub/LAN switch that provides the SPR with DC power, lightening protection, and Ethernet connectivity to the subscriber's PCs/network. The SDA connects to the SPR by a CAT-5e cable.

The SDA provides 10/100BaseT connectivity (depending on the SDA model) to the subscriber's PCs or network (up to four PCs depending on the SDA model).

The SDA is located inside the subscriber's premises, typically mounted on a wall or simply placed on a desktop.

The SDA is available in six models:

■ **SDA-1:** This is a hub that provides one 10BaseT interface (RJ-45 port) with the subscriber's PC and/or network (via a hub or LAN switch).

■ **SDA-4H:** This is a hub and provides four 10BaseT ports for interfacing with the subscriber's PCs/network. In addition, one of the 10BaseT ports provides crossover configuration for crossover-cable connection for interfacing with, for example, other hubs.

■ **SDA-4S models:** Integrated LAN switches, providing four 10/100BaseT interfaces with the subscriber's PCs/network.

   ■ **(standard):** Standard integrated LAN switch, providing four 10/100BaseT interfaces to the subscriber's computers.

   ■ **SDA-4S/VL:** Provides VLANs between its ports and the SPR, ensuring privacy between users of different ports (i.e., multi-tenant VLAN security). For example, all users connected to Port 1 do not "see" users connected to Port 2.

   ■ **SDA-4S/1H3L:** Provides a high priority port (left-most port) for VoIP traffic.

   ■ **SDA-4S/VL/1H3L:** Combines the functionality of the SDA-4S/VL and SDA-4S/1H3L models (VLAN for each port and a high priority port for VoIP).

Figure 9-1 displays a typical setup of the SPR and SDA at the subscriber's premises.

Note: The SDA can also be installed at a base station that has only one BSR. This SDA replaces the need for the BSDU, and provides power and connectivity to the single BSR.

RF link

Subscriber Premises Radio (SPR) located on the roof

CAT-5e

PC

Subscriber Data Adapter (SDA) located inside
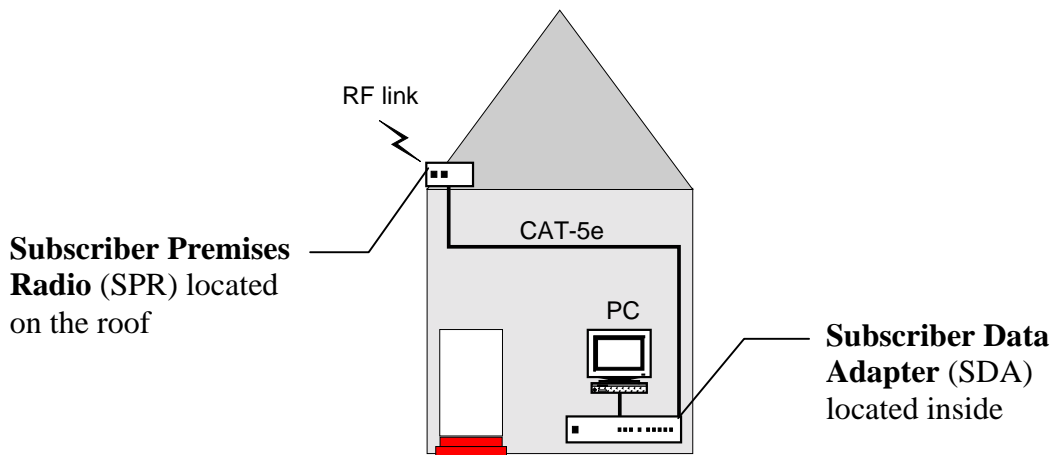
Figure 9-1: Typical SPR and SDA location and connections at subscriber's premises

9.2. Physical Dimensions and Basic Design

The SDA is encased in a chassis. The chassis front panel provides access to the SDA's communication ports. The left-side of the chassis provides a power connector port for connection to an external power adapter. The SDA's bottom panel provides holes for mounting the SDA on a wall

Figure 9-2 displays the SDA-4S models and the SDA-4H.
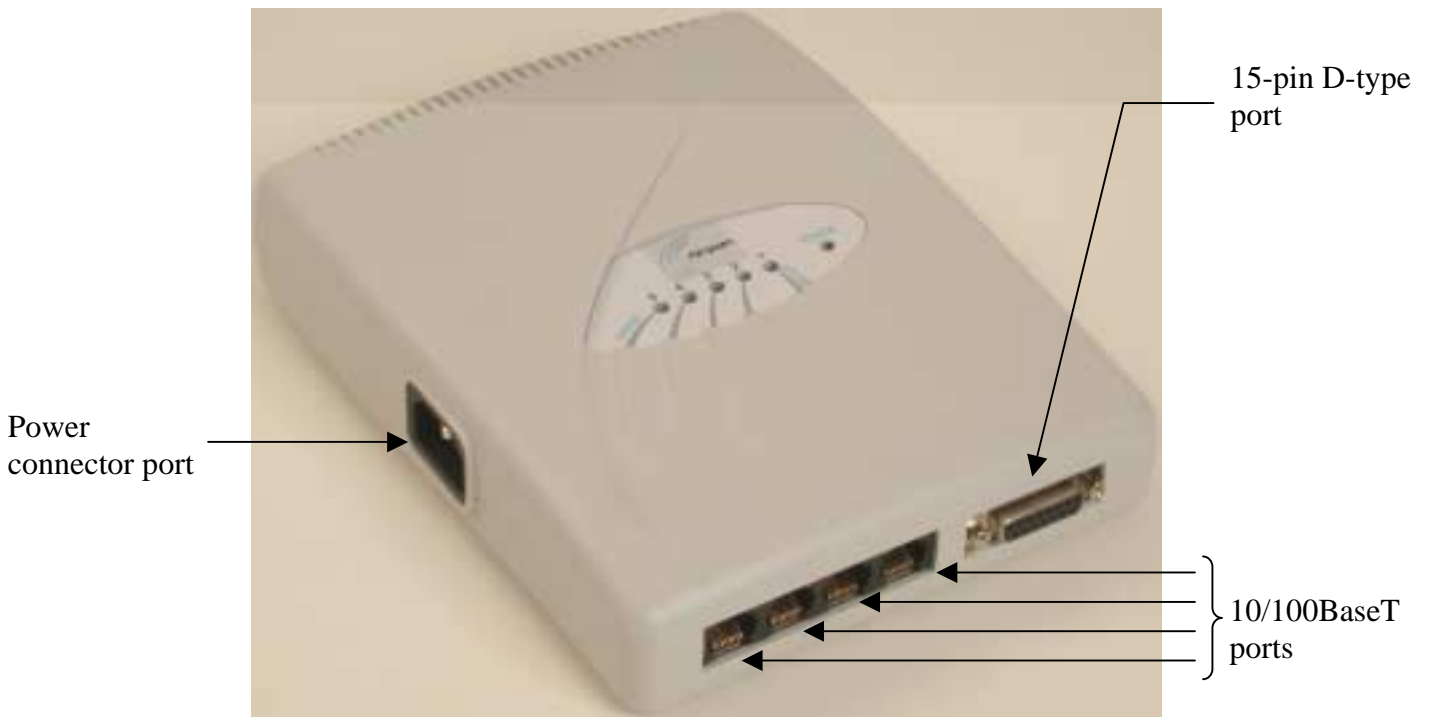
Figure 9-2: SDA-4S models and SDA-4H (front, side, and top panels)

Figure 9-3 displays the SDA-1 model.

15-Pin D-type port

Power connector port

RJ-45 port (10BaseT)

Figure 9-3: SDA-1 (front, side, and top panels)

The SDA's physical dimensions are described in Table 9-1

Table 9-1: SDA Physical Dimensions

Parameter	Value
Height	200 mm (7.87 inches)
Width	150 mm (5.9 inches)
Depth	40 mm (1.57 inches)
Weight	0.53 kg

9.3. Mounting the SDA

The SDA can be wall or desk mounted.

9.3.1. Desktop-Mounting

For desk mounting (horizontal mounting), the chassis' bottom panel provides four rubber feet on each corner.

Warning: For desk mounting, do not place the SDA on a carpeted surface where airflow is restricted and a fire hazard may result.

Figure 9-4: SDA - rear panel

9.3.2. Wall-Mounting

For SDA wall mounting, two mounting hooks are molded into the chassis' bottom panel (see Figure 9-4). The dimensions of the SDA's wall-mounting hooks, located on the chassis bottom panel, are displayed in Figure 9-5.
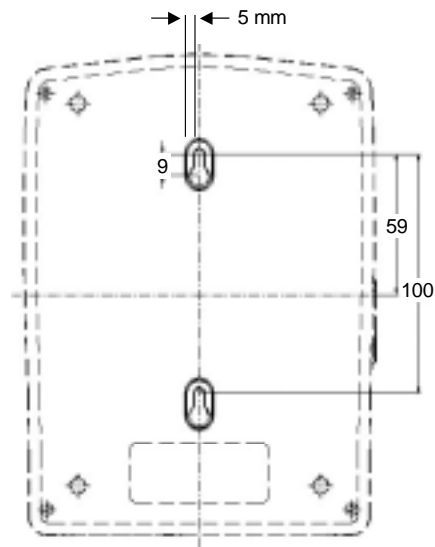
Figure 9-5: SDA mounting footprint details

Notes:
1) Airspan does not supply screws for wall mounting as the size and type of screws depends on the type of wall at the subscriber's premises
2) For reasons of safety both fixing points must be utilized when mounting the unit.
3) The SDA is supplied with a 1-metre AC power lead assembly. Therefore, the unit must be located within reachable distance of the customer's mains power   outlet.
4) The cable must be dressed tidily and not be taught or pose a trip hazard when   connected.
5) The maximum cable run between an SDA and an SPR is 100 meters.

9.4. Connecting to the SPR

The SDA's 15-pin D-type port connects to the SPR's 15-pin D-type port by a CAT-5e cable.

> **Note:** For a detailed description on connecting the SDA to the SPR, see Chapter 8, "Installing the SPR".

9.5. Connecting to the Subscriber's Ethernet Network

The SDA provides RJ-45 port(s) for Ethernet connectivity to the subscriber's PCs/network. The number of Ethernet ports and the speed of the Ethernet connection depend on the SDA model. Table 9-2 describes the number of ports and transmission speeds supported by the various SDA models.

Table 9-2: Number of Ports and Transmission Speed of SDA Models

SDA Model	RJ-45 Ports	Speed (Mbps)
SDA-1	1	10
SDA-4H	4	10
SDA-4S models (SDA-4S; SDA-4S/VL; SDA-4S/1H3L; SDA-4S/VL/1H3L)	4	10/100

The following list describes the location of the Ethernet ports for the various SDA models:

■ **SDA-1:** one RJ-45 port (see Figure 9-6)

RJ-45 port

Figure 9-6: SDA-1 with one Ethernet port

■ **SDA-4H:** four RJ-45 ports (see Figure 9-7).

Note: The left-most port (J5) is a crossover port.

R-J45 connector (J5)
- cross over

R-J45 connector (J4)

R-J45 connector (J3)

R-J45 connector (J2)

D-type connector (J1)
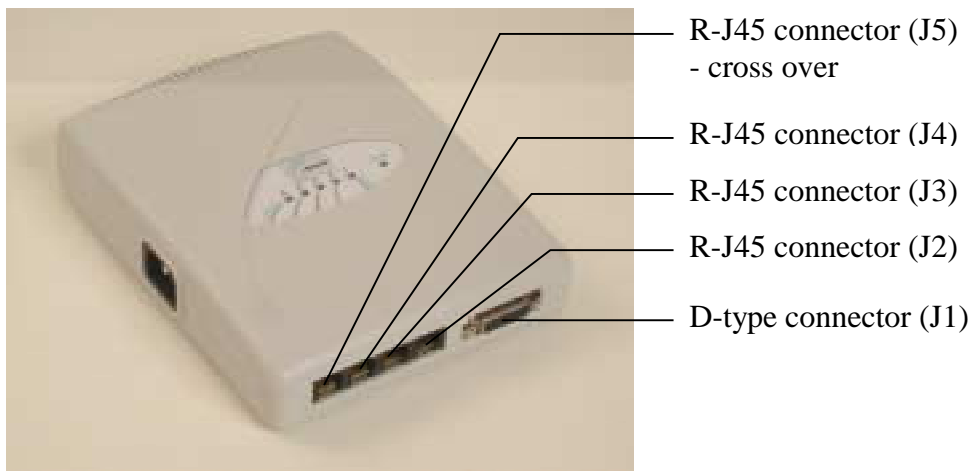
Figure 9-7: SDA-4H with four Ethernet ports

■ **SDA-4S models (SDA-4S, SDA-4S/VL, SDA-4S/1H3L, and SDA-4S/VL/1H3L):** four 10/100BaseT RJ-45 ports. These ports support 10/100 Mbps autosensing, and MDI/MDI-X automatic crossover. This allows you to connect straight-through or crossover CAT-5 cables to these ports.
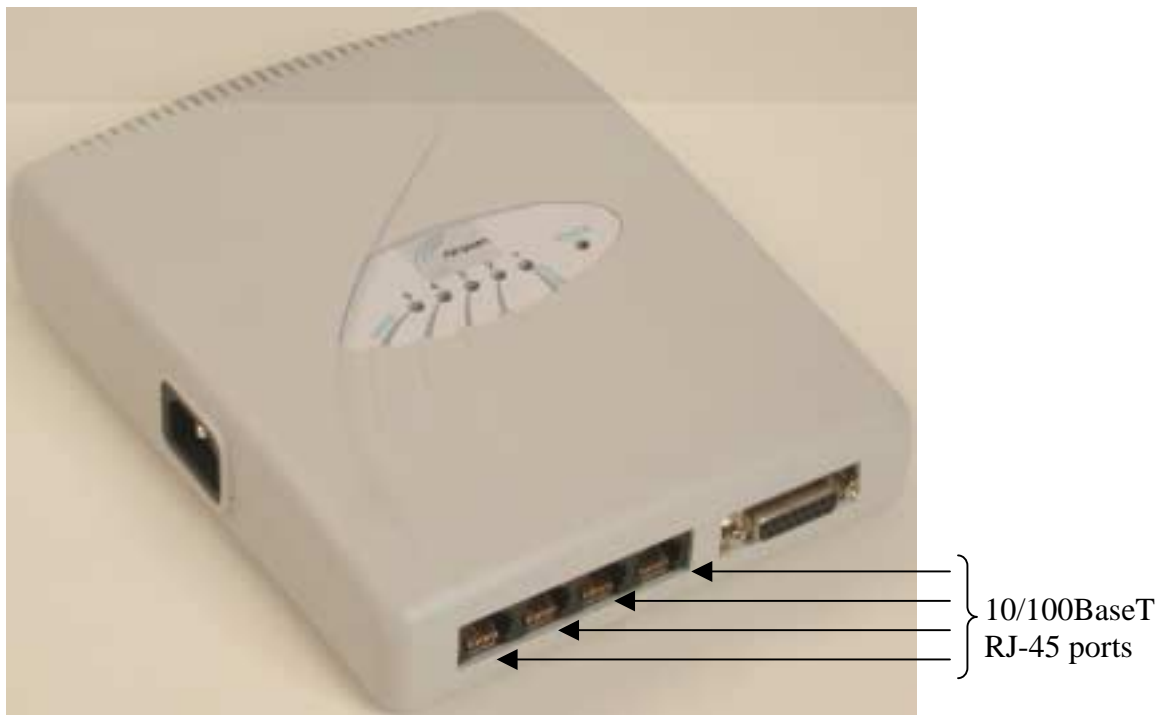
Figure 9-8: SDA-4S RJ-45 Ethernet Ports

9.5.1. Connecting to PCs

The SDA connects to the subscriber's PC(s) through the SDA's Ethernet port (RJ-45).

Note: To avoid electrical or fire hazard, ensure that the data connections to the SDA is made prior to connecting the power supply.

The SDA-to-subscriber PC cable configurations are as follows:

■ **Connector:** 8-pin RJ-45

■ **Cable:** straight-through Ethernet cable

■ **Connector Pinouts:**

RJ-45: SDA-1, SDA-4H (J2, J3, J4), SDA-4S		RJ-45 crossover cables: SDA-4H (J5)	
Pin	**Function**	**Pin**	**Function**
1	+RX	1	+Tx
2	-RX	2	-Tx
3	+TX	3	+Rx
4	NC	4	NC
5	NC	5	NC
6	-TX	6	-Rx
7	NC	7	NC
8	NC	8	NC

To connect the SDA to the subscriber's PC(s):

1. Connect the **8-pin RJ-45 male** connector, at the one end of the Ethernet cable, to the SDA's RJ-45 Ethernet port (see Figure 9-9).

2. Connect the **8-pin RJ-45 male** connector, at the other end of the Ethernet cable, to the subscriber's PC (or device). (See Figure 9-9.)
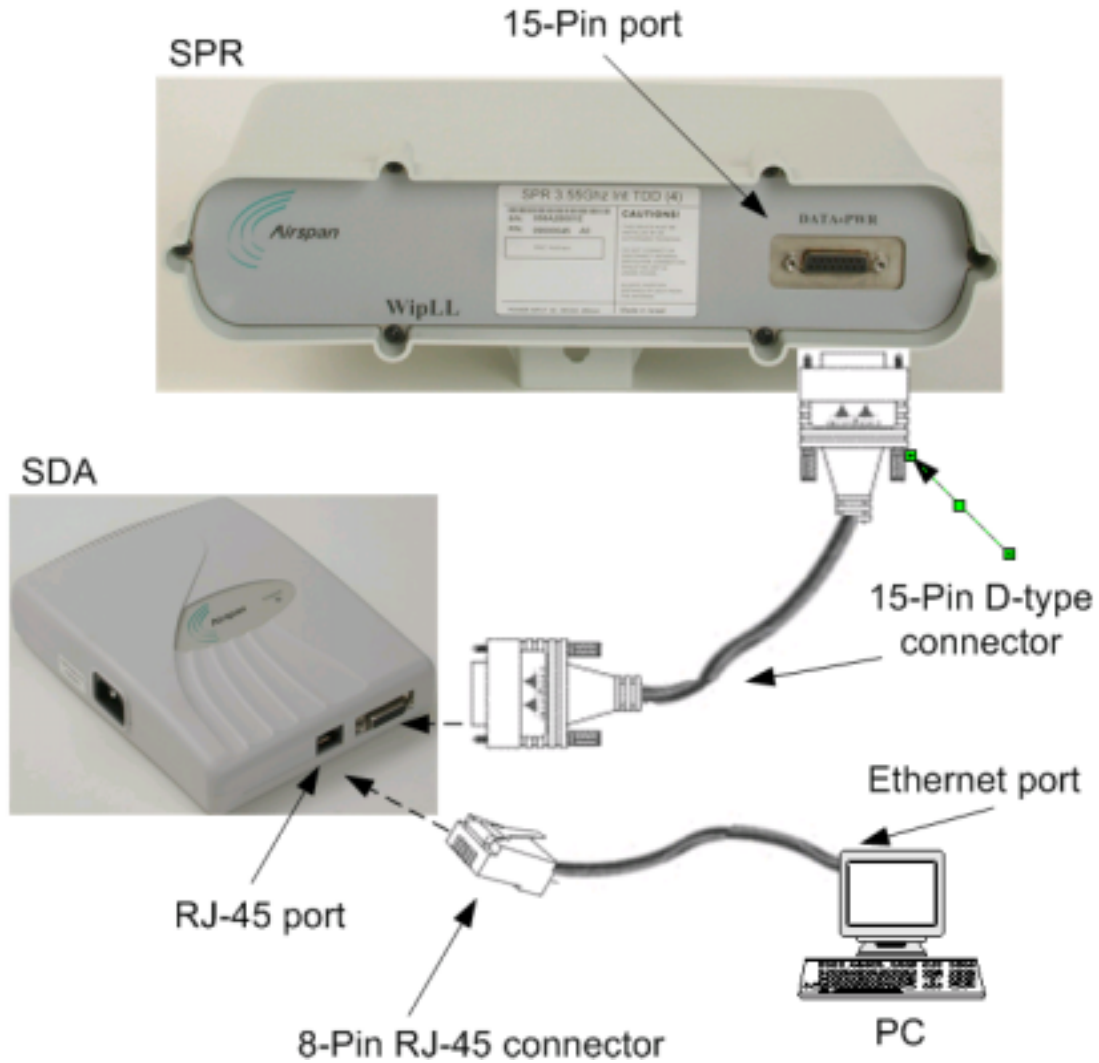
Figure 9-9: SDA-to-PC Cable Connections

Note: The SDA-4S RJ-45 ports support MDI/MDI-X automatic crossover. This means that straight-through or crossover CAT-5 cables can be connected to these ports.

9.5.2. Connecting to a Hub

The SDA-4S models and SDA-4H can be connected to another hub (for example, for daisy chaining). The ports of the SDA-4S models support MDI/MDI-X automatic crossover, allowing connection of straight-through or crossover cables. However, for the SDA-4H model, only the left-most RJ-45 port (J5) is a crossover port (see Figure 9-7).

The SDA-4S and SDA-4H cable configurations for connectivity to a hub, are as follows:

■ **Connector:** 8-Pin RJ-45

■ **Cable:**

  ■ **SDA-4H:** crossover-cable

  ■ **SDA-4S models:** straight-through or crossover cables (due to MDI/MDI-X ports)

■ **Connector pinouts:** SDA-4H:

SDA-4H RJ-45 (J5)	
Pin	**Function**
1	+TX
2	-TX
3	+RX
4	NC
5	NC
6	-RX
7	NC
8	NC

To connect SDA-4S or SDA-4H to a hub:

1. Connect the RJ-45 male, at one end of the cable, to the SDA-4H's left-most RJ-45 port (J5), or any SDA-4S's RJ-45 port.

2. Connect the RJ-45 male, at the other end of the cable, to the hub.
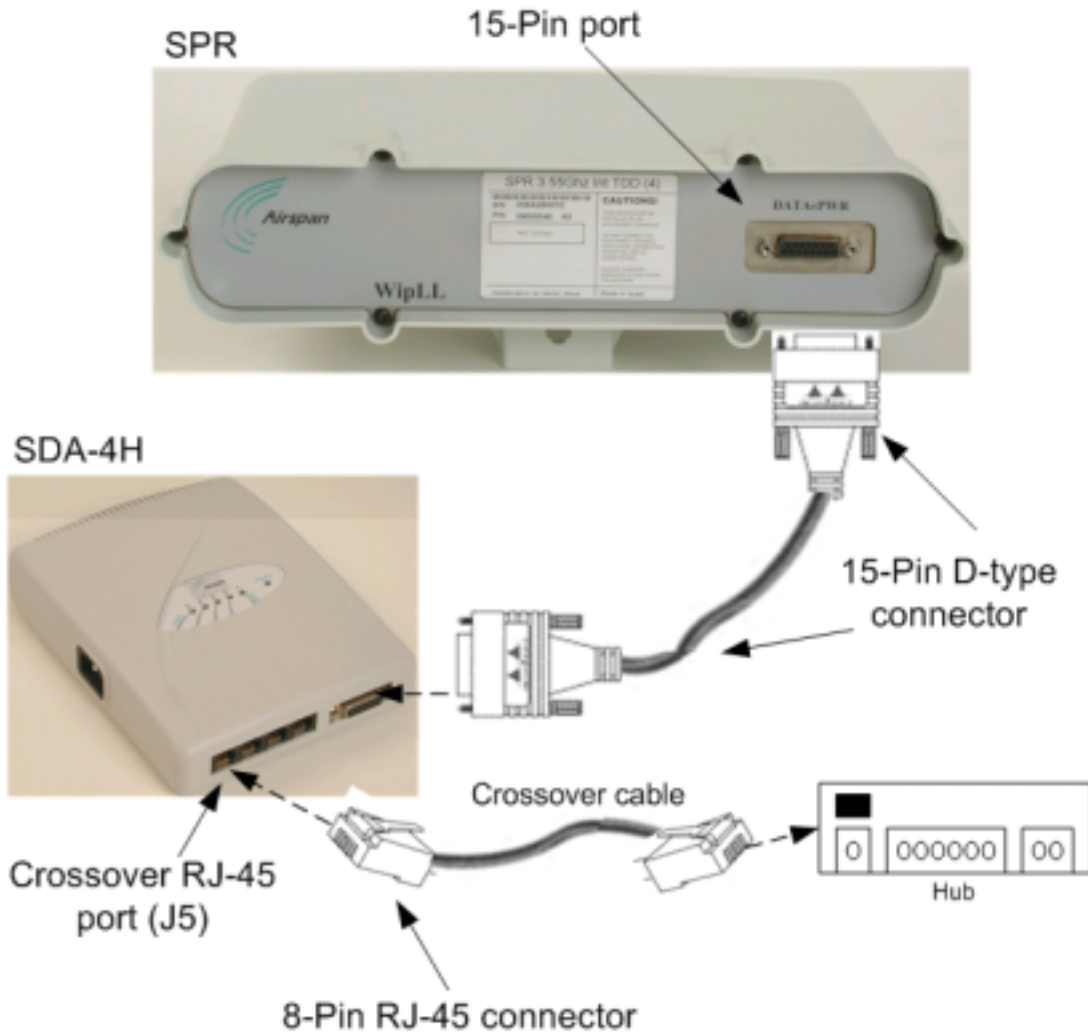
Figure 9-10: SDA-4H Crossover Cable Connections to Hub
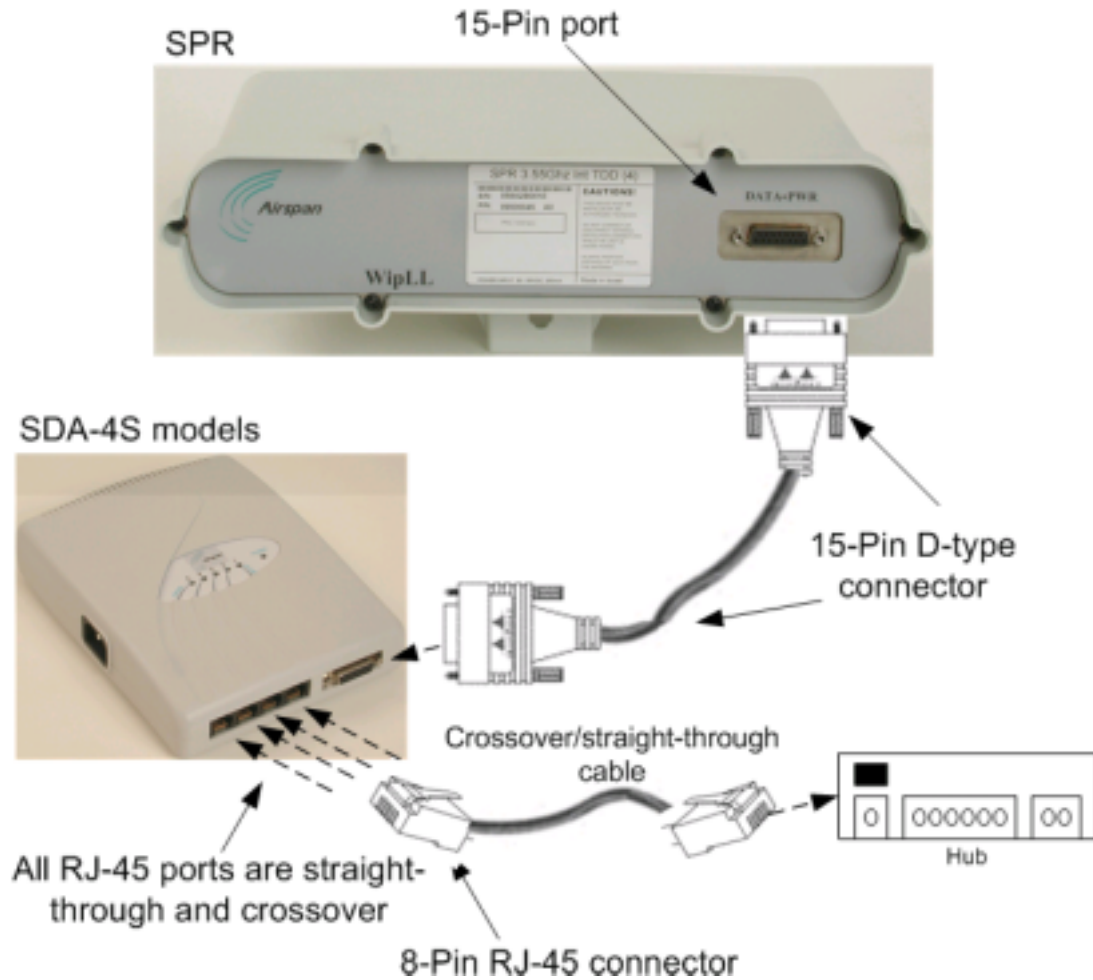
Figure 9-11: SDA-4S Crossover/Straight-Through Cable Connections to Hub

	Note: The SDA-4S RJ-45 ports support MDI/MDI-X automatic crossover. Therefore, crossover CAT-5 cables can be connected to any of the ports.

9.5.3. Connecting to a VoIP Network

The **SDA-4S/1H3L** and **SDA-4S/VL/1H3L** model's left-most RJ-45 Ethernet port assigns high priority to VoIP trafic. This port is used to connect to the subscriber's VoIP network. This port assigns high priority to VoIP traffic, as opposed to the other RJ-45 ports, which assigns lower priority.

The cable connections for connecting the **SDA-4S/1H3L** and **SDA-4S/VL/1H3L** models to the subscriber's VoIP network, are as follows:

- **Connector:** 8-pin RJ-45 male

- **Cable:** straight-through or crossover

- **Connector pinouts:**

RJ-45 (left-most port)	
Pin	**Function**
1	+RX
2	-RX
3	+TX
4	NC
5	NC
6	-TX
7	NC
8	NC

To connect to the VoIP network:

1. Connect the RJ-45 male connector, at the one end of the Ethernet cable, to the left-most RJ-45 port on the front panel of the **SDA-4S/1H3L** and **SDA-4S/VL/1H3L** chassis (see Figure 9-12).

2. Connect the RJ-45 male connector, at the other end of the cable, to the VoIP network, for example, to a Residential Gateway (see Figure 9-12).
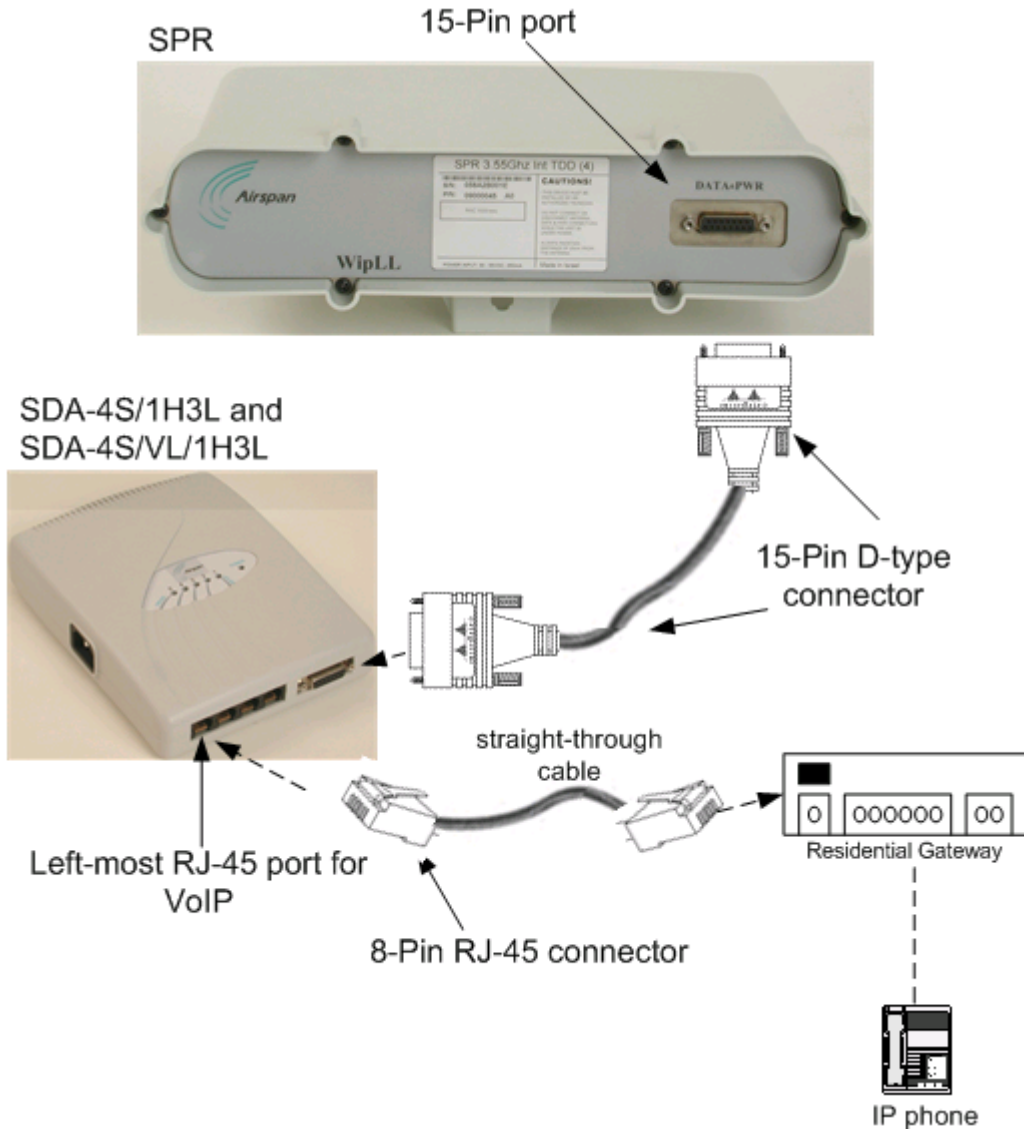
Figure 9-12: Connecting VoIP RJ-45 Port (for SDA-4S/1H3L **and** SDA-4S/VL/1H3L)

9.6. Connecting AC Power

The SDA receives AC power by connecting to a standard 110–240 VAC wall outlet. In turn, the SDA provides 48 VDC nominal power to the SPR (minimum of 30 VDC: maximum of 55 VDC).

Table 9-3 lists the SDA power supply specifications.

Table 9-3: SDA Power Supply Specifications

Power parameter	Units
Voltages	110-240 VAC
Frequency	50/60 Hz
Amps	0.3-0.7A

The following lists the cable connection between the SDA and the power outlet:.

■ **Connector:** AC IEC 320 type (female)
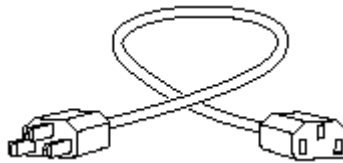
Figure 9-13: Power Chord

■ **Cable:** 3-core 0.7mm² type (maximum length is 1.5 m)

For all SDA models, the power port is located on the left-panel of the chassis, as displayed in Figure 9-14 for SDA-1, and in Figure 9-15 for SDA-4H and SDA-4S models.

Power port

Figure 9-14: Location of SDA-1 power port
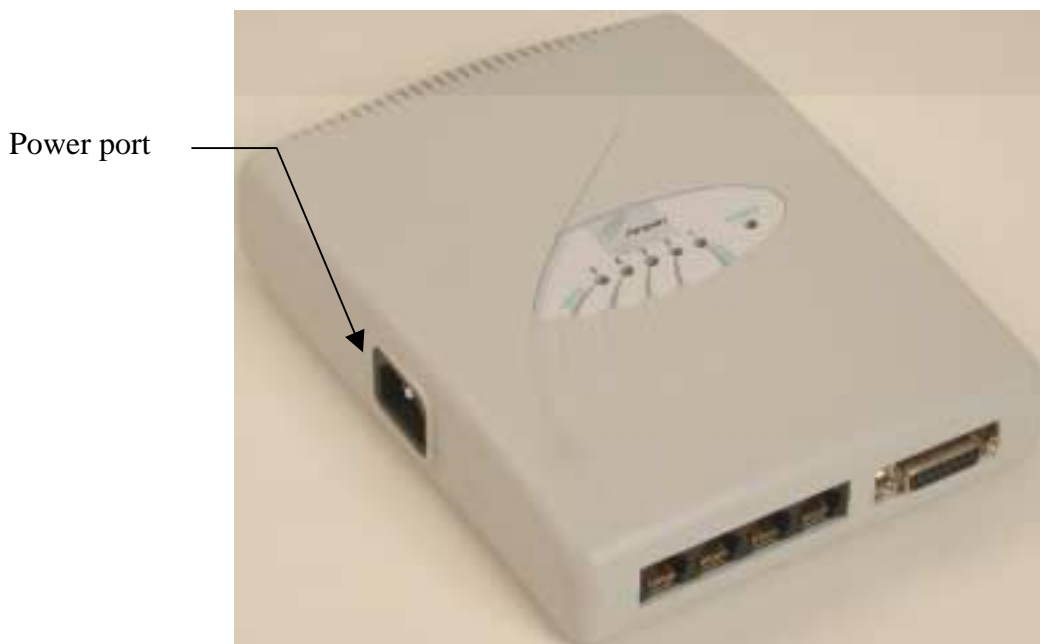
Power port

Figure 9-15: Location of SDA-4S model's and SDA-4H power port

> **Warning:** Ensure that plugs fitted to mains power leads for subscriber premises equipment are compatible with AC mains sockets. Do not replace plugs on power leads to suit local requirements without first verifying grounding practice for the country and equipment in question.
>
> Careful consideration must be given to issues including local wiring requirements, cable color-coding, safety grounding, and circuit protection requirements.

Prior to connecting to the power outlet, the following pre-connection inspection should be performed on power sockets:

■ Power socket shall be visually inspected to ensure that no other equipment is connected to the power outlet.

■ No damage to the power outlet.

■ No water or dampness on or around the power outlet.

■ The power outlet shall be checked using a proprietary plug tester such as a "Martindale Ze" type. Checks are required to verify the earth loop impedance value and the presence of phase, neutral, and earth connections.

> **Note:** To avoid electrical or fire hazard, ensure that the data connections to the SDA is made prior to connecting the SDA to the power supply.

To connect the SDA to AC power supply:

1. Plug the power plug female, at the end of the AC power chord, into the power plug male located omn the left of the SDA chassis (see Figure 9-16).

2. Plug the power plug male, at the other end of the AC power chord, into the wall power outlet (110-240 VAC). (See Figure 9-16.)

3. Verify that the power is received by the SDA by checking that the **POWER** LED light (green) is on.
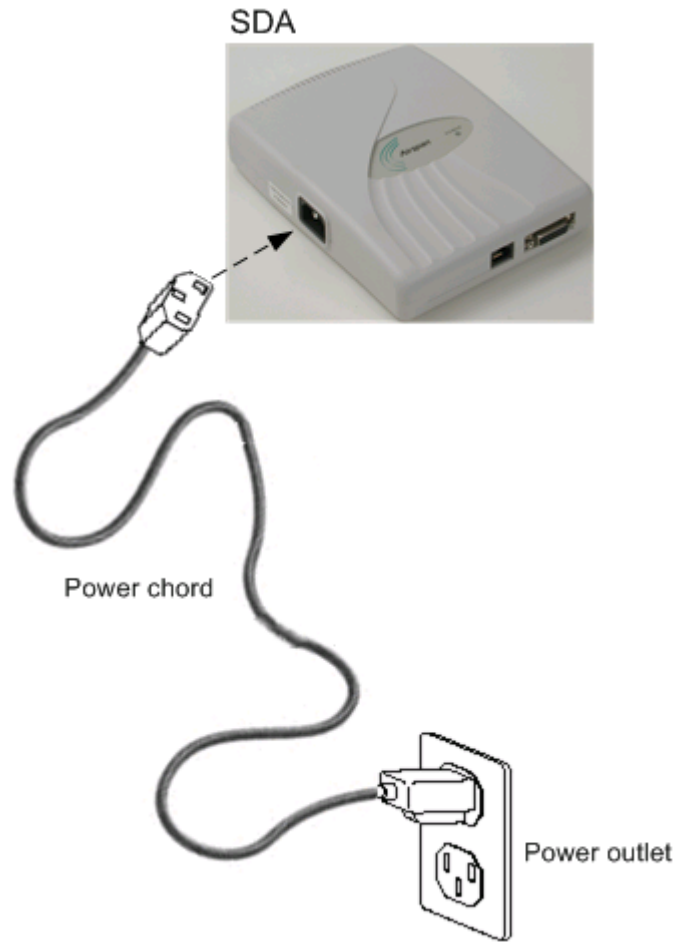
Figure 9-16: SDA Power Cable Connections

9.7. LED Display

The SDA-4H and SDA-4S models provide LED indicators that indicate network connection, traffic status, and power. These LEDs are located on the top panel of the chassis.

9.7.1. SDA-4H

Figure 9-17 displays the location of the SDA-4H LED indicators.
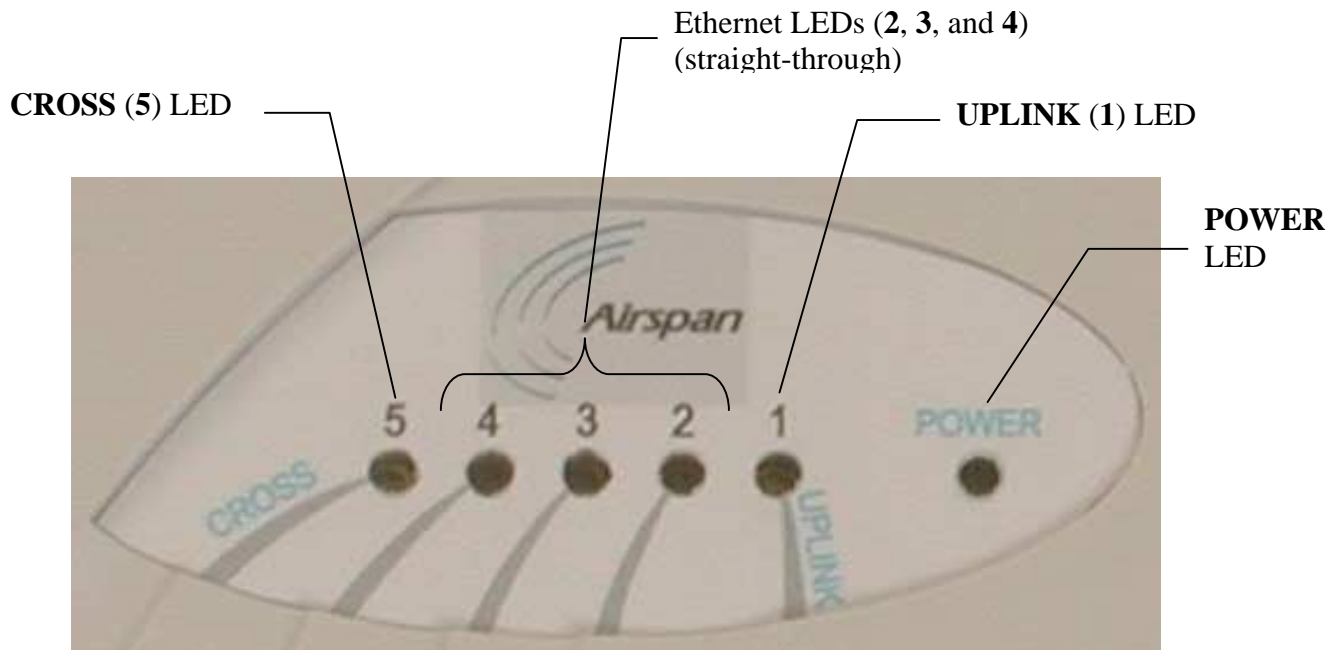
Figure 9-17: SDA-4H LED indicators

Table 9-4 describes the SDA-4H LED indicators.

Table 9-4: Description of the SDA-4H LED Indicators

LED	Color	Status	Meaning
1 (**UPLINK**)	Yellow	On	Physical link between SDA-4H and SPR
		Blinking	Traffic flow between SDA-4H and SPR
		Off	No link between SDA-4H and SPR
2, **3**, and **4**	Yellow	On	Physical link between SDA-4H and Ethernet network
		Blinking	Traffic flow between SDA-4H and Ethernet network
		Off	No link between SDA-4H and Ethernet network
5 (**CROSS**)	Yellow	On	Physical link between SDA-4H and crossover Ethernet port connection
		Blinking	Traffic flow between SDA-4H and crossover Ethernet port network
		Off	No link between SDA-4H and crossover Ethernet port connection
POWER	Green	On	Power received by the SDA-4H.
		Off	No power received by SDA-4H

9.7.2. SDA-4S Models

Table 9-5 describes the SDA-4S model's LED indicators.

Table 9-5: Description of the SDA-4S Model's LED Indicators

LED	Color	Status	Meaning
1	**Orange**	On	Physical link (10BaseT) between SDA-4S and SPR
		Blinking	Traffic flow between SDA-4S and SPR
		Off	No link between SDA-4S and SPR
2, **3**, **4**, and **5**	**Green**	On	100BaseT physical link between SDA-4H and Ethernet network
		Blinking	100BaseT traffic flow between SDA-4H and Ethernet network
		Off	No traffic flow between SDA-4S and Ethernet network
	Orange	On	10BaseT physical link between SDA-4H and Ethernet network
		Blinking	10BaseT traffic flow between SDA-4H and Ethernet network
		Off	No traffic flow between SDA-4S and Ethernet network
POWER	**Green**	On	Power received by the SDA-4S model.
		Off	No power received by SDA-4S model.

10

Installing and Configuring the IDR

This chapter describes the installation of the WipLL **Indoor Data Radio** (IDR) that is installed at the subscriber's premises. The IDR unit is an optional WipLL unit that replaces the SPR and SDA units, and combines the functionalities of the SPR and SDA.

The IDR has a built-in antenna that provides an interface for transmission with the base station, as well as an interface for 10Base-T Ethernet for the subscriber's network. However, unlike the SDA, a separate power supply unit powers the IDR.

The IDR is available in two models: a model with an internal antenna, and a model with a TNC connector for a third-party external antenna.
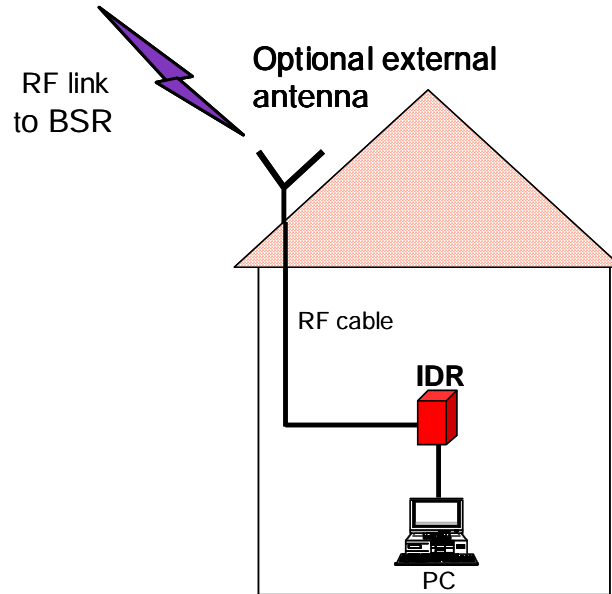
Figure 10-1: Typical IDR setup at subscriber's premises (showing optional antenna)

Figure 10-2: IDR with lower cover removed exposing ports

Warning: To avoid electrical or fire hazard, ensure that all connections to the IDR are performed prior to connecting the power supply.

10.1. Mounting the IDR

The IDR may be mounted in the following ways:

■ Desk

■ Pole

■ Wall

> **Note:** Before mounting or attaching any brackets to the IDR ensure that all cables are securely attached and that the unit functions correctly in the proposed location.

10.1.1. Desk Mounting

The IDR may be mounted on a desk—horizontally or vertically—to obtain optimal signal strength from a corresponding BSR.

10.1.1.1. Vertical-Desk Mounting

A base plate is provided to mount the unit vertically on the desk, i.e., in standing position. The base plate is designed to fit in one position only.

To desk mount the IDR in a vertical position:

■ Insert the IDR into the base and press firmly until the tabs click into place. See Figure 10-3.

Desk-
mounting
plate
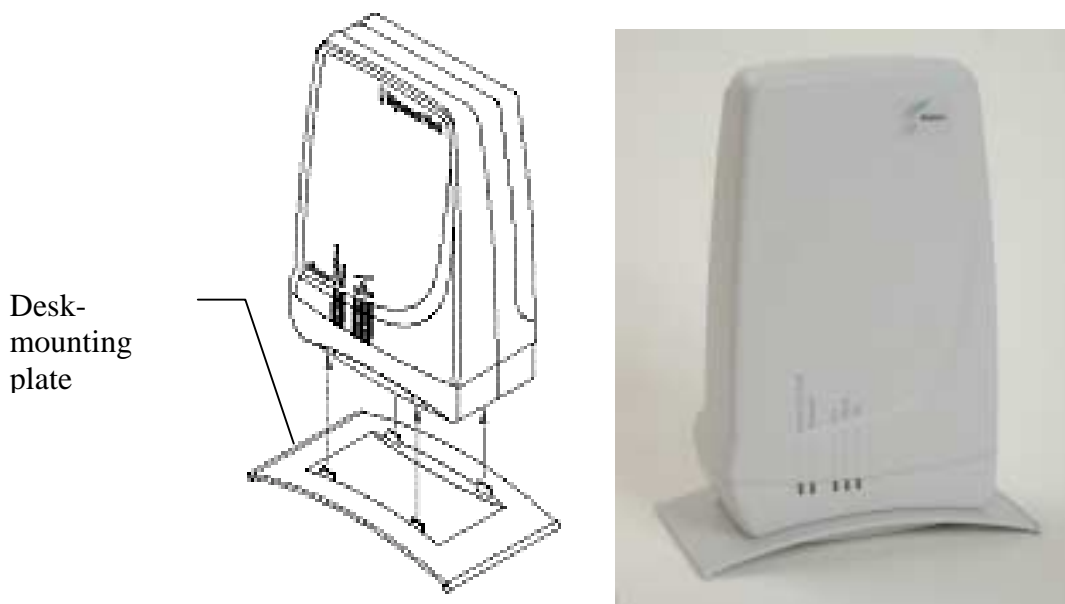
Figure 10-3: IDR vertical desk mounting

10.1.1.2. Horizontal-Desk Mounting

To position the IDR horizontally on the desk, four rubber pads, supplied with the unit, must be fitted to avoid damage to mounting surfaces.

mTo desk mount the IDR in a horizontal position:

■ Secure the rubber pads to the posts provided on the rear of the IDR using four self-tapping screws. See Figure 10-4.
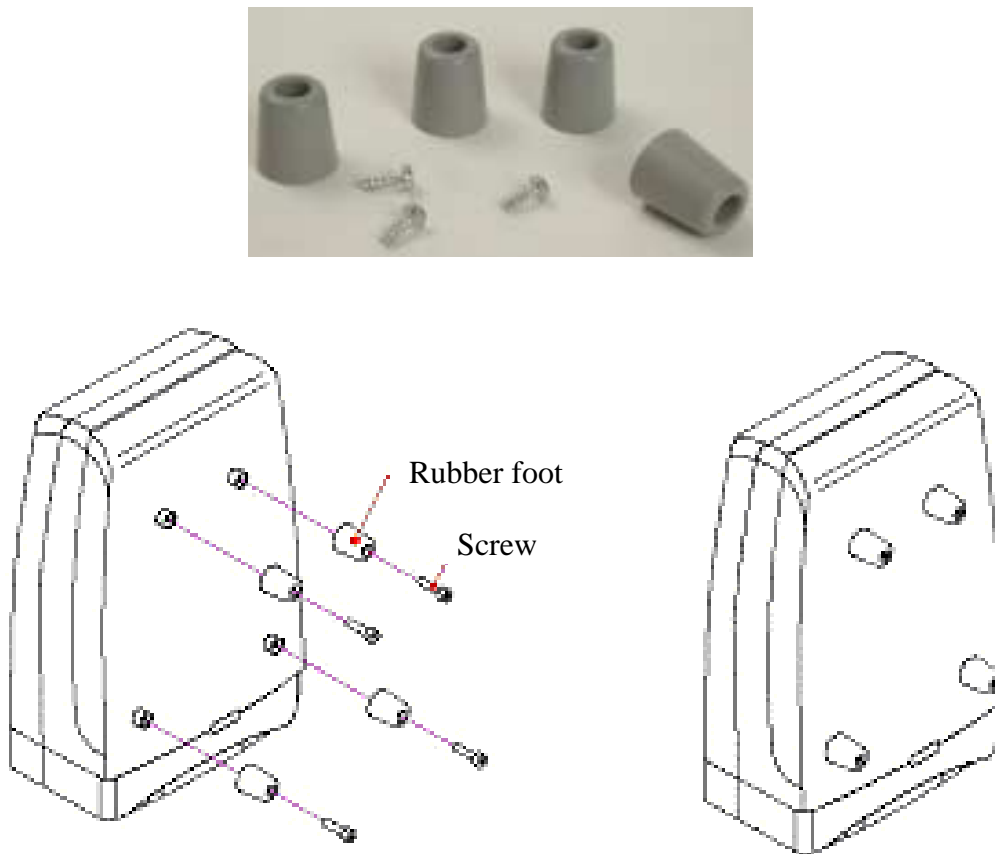
Figure 10-4: IDR horizontal desk mounting using supplied rubber pads and tapping screws

10.1.2. Wall and Pole Mounting

The IDR may be mounted to a wall or to a 5 cm-diameter pole. Wall and pole mounting both use the same mounting brackets and wall hanger plate.

10.1.2.1. Assembling the Bracket and Hanger Plate

The wall hanger plate secures the IDR to a wall or pole. The wall bracket and hanger plate allows positioning the IDR in the correct orientation. Holes are provided in the wall hanger plate for both pole and wall mounting options

To assemble the bracket and hanger plate:

1. Insert a 4 mm hex nut into the slot on the tilt arm component

2. Holding the nut in place, attach the tilt arm to the mounting bracket using a 4 mm socket head bolt. Hand tighten the bolt only. See Figure 10-5.

3. Affix the complete mounting assembly to the rear of the IDR using the 4-off self-tapping screws supplied with the kit.
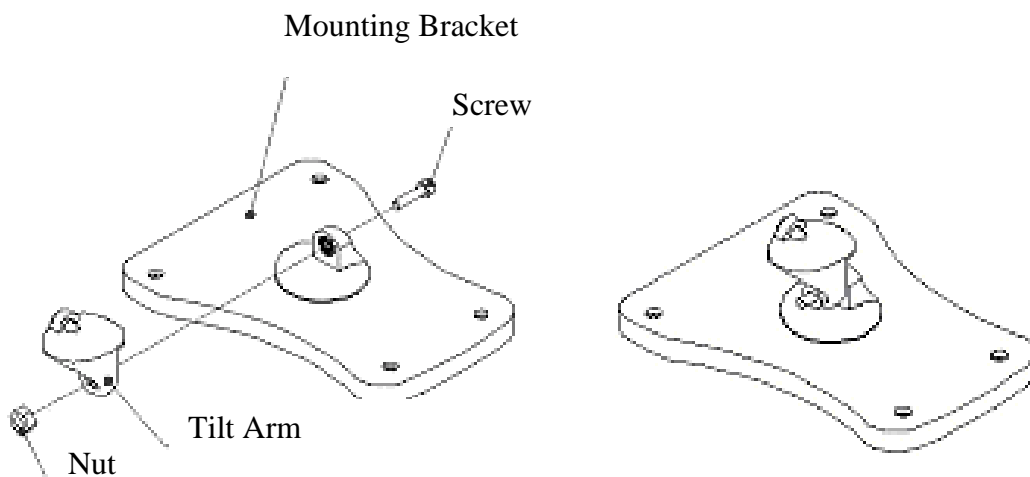
Mounting Bracket

Figure 10-5: Mounting bracket assembly

4. Attach the wall bracket assembly to wall hanger using an M4 socket-head bolt and nut as shown in Figure 10-6. The bolt is only to be hand tightened at this stage.

Wall Hanger

M-4 nut

Screw

Mounting bracket
assembly
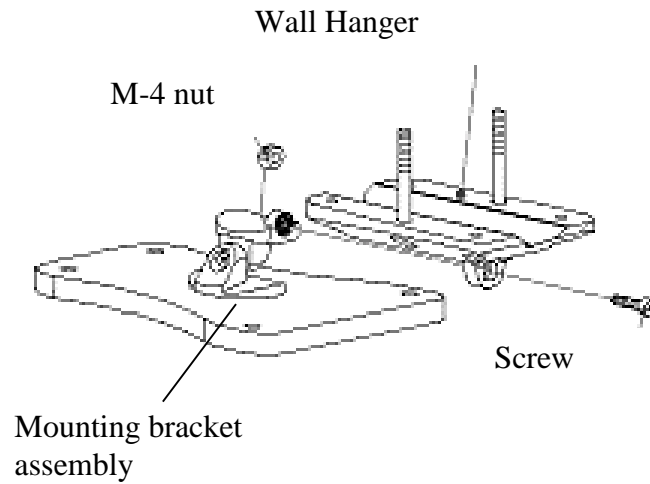
Figure 10-6: Wall hanger fixing method
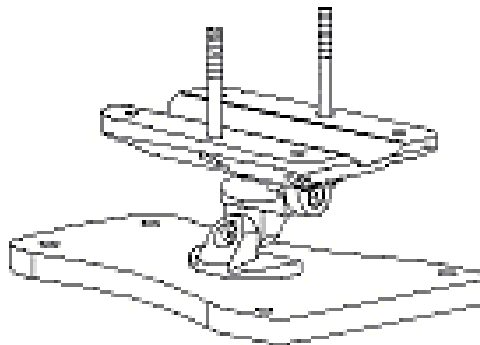
Figure 10-7: Wall hanger & mounting bracket assembly

5. Once assembled, the IDR mounting bracket assembly may be secured to the rear of the IDR using the 4-off self-tapping screws supplied in the unit fixing kit. See Figure 10-8.

Self - tapping Screws
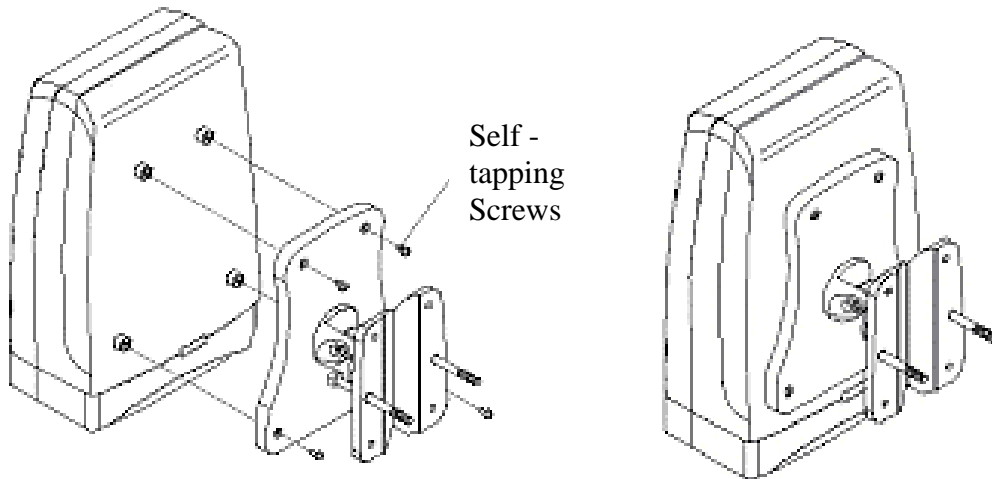
Figure 10-8: Mounting bracket assembly secured to IDR

10.1.2.2. IDR Pole Mounting

Prior to mounting the IDR to a pole the wall mounting bracket assembly must be fitted as described in the previous section.

To pole mount the IDR:

1. Offer up the IDR assembly to the pole as shown in Figure 10-9.

2. Insert 2-off M10 bolts through the holes in the wall hanger.

3. Slide the clamp-holder into position and secure using washers, spring-washers and nuts as illustrated in Figure 10-10. Finger-tighten the fasteners.

4. Slide the IDR to the required location on the pole and fully tighten the fasteners.
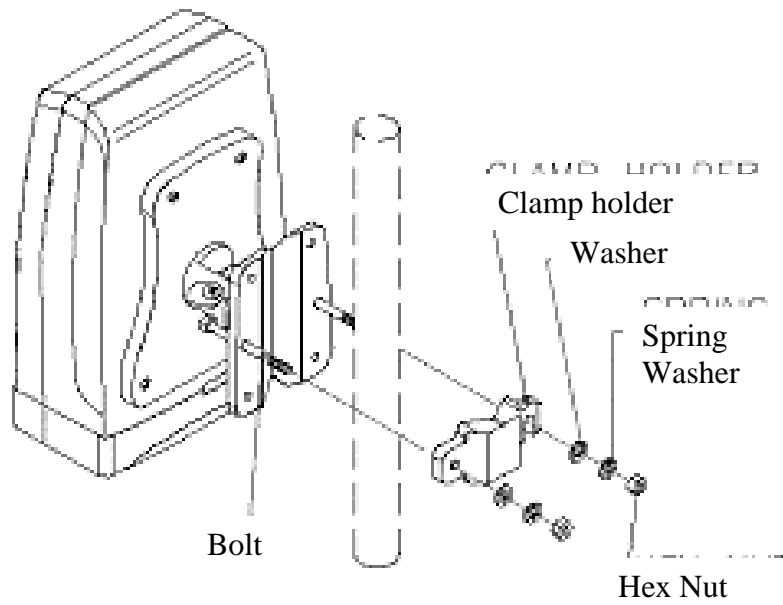
Figure 10-9: IDR pole mounting components
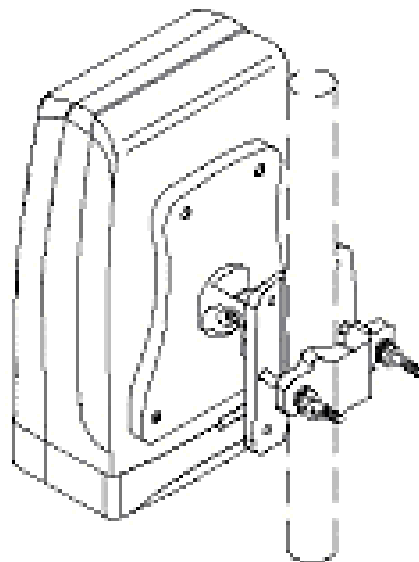
Figure 10-10: IDR secured to a pole

To set the correct IDR inclination:

1. Loosen the 2-off M4 socket head screws on the mounting bracket tilt-arm

2. Position the IDR at the desired angle.

3. Re-tighten the 2 off socket screws on the tilt arm.

10.1.2.3. IDR Wall Mounting

Warning: Prior to drilling holes in a wall ensure that there are no hidden services such as electricity cables or water pipes.

A stop must be used on the power drill to ensure that bored holes do not exceed 35 mm.

To mount the IDR on a wall:

1. Loosen the 2-off M4 socket head screws on the mounting bracket tilt-arm and remove the wall hanger.

2. Offer up the wall hanger to the wall and scribe through the mounting hole locations.

3. Drill holes to suit the type of wall fixing.

4. If required insert anchor plugs suited to the wall material.

5. Affix the wall hanger using 4-off screws suited to the anchor plugs and wall material.

6. Re-attach the IDR mounting bracket to the wall hanger. Finger tighten the screws.

7. Position the IDR at the desired inclination.

8. Re-tighten the screws to lock the IDR in position.

10.1.3. Connecting a Third-Party External Antenna

The IDR provides a TNC-type connector for connecting the IDR to a third-party antenna. This antenna can be placed on the subscriber's window sill to provide better RF signal reception.

Note: Airspan supplies unterminated cables for N-type connectors. Therefore, refer to the cable crimping procedures for N-type connectors detailed in Appendix tbd, "Cable Crimping".

Connector: TNC-type

10.1.4. Connecting to an Ethernet Network

The IDR provides one Ethernet interface for the subscriber's Ethernet network. This port is located on the front panel, and labeled **Ethernet.**

Connector: 8-Pin RJ-45

Cable: CAT-5e

Connector pinouts:

Pin	Function
1	RX+
2	RX-
3	TX+
4	Not Connected
5	Not Connected
6	TX-
7	Not connected
8	Not connected

10.1.4.1. Ethernet LED Indicator

The IDR provides one LED that indicates an Ethernet connection. This LED is labeled **Ethernet** and is located on the IDR's top panel.

LED	Color	Status	Indicates
Ethernet	Yellow	On	Physical link between IDR and Ethernet network
		Off	No physical link between IDR and Ethernet network
		Blink	Data is flowing through the Ethernet port

10.2. Positioning IDR for Optimum RF Reception

Once mounted to a wall, pole, or desk the IDR unit may be positioned to ensure the best RF signal communication with the BSR. The RF signal strength is indicated by three LEDs on the IDR chassis. The following table describes the RF signaling strength indicator LEDs.

LED	Color	Status	Indicates
LO	Green	Lit	Low strength signal
MED	Green	Lit	Medium strength signal
HI	Green	Lit	High strength signal
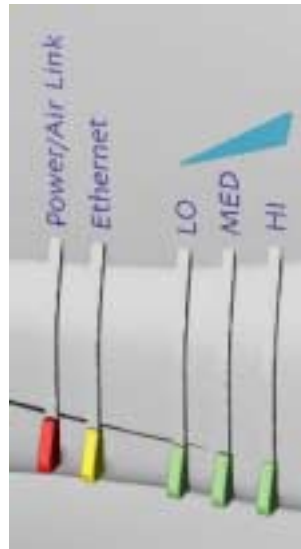
Figure 10-11: IDR LED indicators

To position the IDR for optimum RF signal:

◼ Position the IDR until all three RF signaling strength indicator LEDs are lit.

Refer to Section 10.1.2, "Wall and Pole Mounting" page 10-6 for details on adjusting IDR wall and pole mounting position.

For desk-top mounting, the IDR can be simply relocated to obtain the strongest signal.

10.3. Connecting Power Supply

The IDR is powered by an external power supply (*Triple Output External Adapter*). The IDR connects to the power supply via the power port located on the IDR's front panel.

The following table lists the external power supply specifications:

Power parameter	Units
Voltages	110-240 VAC
Frequency	50 to 60Hz
Maximum power consumption	Less than 15W

Warning: Ensure that plugs fitted to mains power leads for subscriber premises equipment are compatible with AC mains sockets. Do not replace plugs on power leads to suit local requirements without first verifying earthing practice for the country and equipment in question.

Careful consideration must be given to issues including local wiring requirements, cable color-coding, and safety earthing and circuit protection requirements.

Warning: To avoid electrical or fire hazard, ensure that the data connections to the IDR are made prior to connecting the power supply.
The AC mains must be capable of supplying at least 230 VAC

Prior to connecting to the power outlet, the following pre-connection inspection should be performed on power sockets:

■ Power socket shall be visually inspected to ensure that no other equipment is connected to the power outlet.

■ There is no physical sign of damage to the power outlet.

■ There should not be any visible sign of water or dampness on or around the power outlet.

■ The plug and socket assemblies are to be firmly secured.

■ The power outlet shall be checked using a proprietary plug tester such as a 'Martindale Ze' type. Checks are required to verify the earth loop impedance value and the presence of phase, neutral and earth connections.

Connector: 6-Pin power connector

Cable: 3-core 0.7mm² type

Connector pinouts:

Pin	Function
1	+6.5V
2	+5V
3	3.3V
4	GND
5	Not connected
6	Not connected

To connect the power:

1. Connect the IDR's 6-Pin power port to the supplied power adapter.

2. Connect the power chord to the adapter and then connect the other end to the wall socket.

10.3.1. Power LEDs

The IDA provides a power LED indicator, labeled **Power**, which indicates whether a power supply exists. The **Power** LED is located on the front panel of the IDR chassis.

LED	Color	Status	Meaning
Power	Red	On	The SDA receives power supply
		Off	No power received

10.4. Configuring the IDR

To perform IDR initial configuration, you need to connect the IDR's RJ-11 port to the serial port of a PC running the WipLL network management application (i.e., WipConfig).

10.4.1. Connecting to a PC

The IDR provides a serial connection to a PC. The IDR's RJ-11 port labeled **Serial**, located on the front panel, connects to the serial port of a PC via a cable with an RJ-11 connector on the one end, and a 9-Pin D-type connector on the other (i.e., a direct serial cable connection-DCC).

■ **Connector:**

   ■ **6-Pin RJ-11 male** to IDR

   ■ **9-Pin D-type male** to PC adapter

■ **Cable:**

   ■ **Straight-through cable** with 6-Pin RJ-11 male on one end and 9-Pin D-type female on the other (Connects between IDR and crossed-over cable)

   ■ **Cross-over cable** with 9-Pin D-type male on one end and 9-Pin D-type female on the other (connects straight-through cable to PC)

■ **Connector pinouts:**

Straight-through cable		Crossover cable	
6-Pin RJ-11		9-Pin D-type female	9-Pin D-type male	9-Pin D-type male
Pin	Function	Pin	Pin	Pin
1	RX	2	4	3
2	Not connected	-	-	-
3	Not connected	-	-	-
4	Not connected	-	-	-
5	GND	5	1	5
6	TX	3	3	2
		-	-	-
		-	-	-
		-	-	-

To connect the IDR to the WipLL management station (PC):

1. Connect the **6-Pin RJ-11** connector to the IDR's RJ-11 port (labeled **Serial**) located on the IDR's front panel (see Figure 10-12).

2. Connect the **9-Pin D-type female** connector, at the other end of the straight-through cable, to the **9-Pin D-type male** connector of the cross-over cable (see Figure 10-12).

3. Connect the **9-Pin D-type male** connector, at the other end of the cross-over cable, to the PC's serial port (see Figure 10-12).
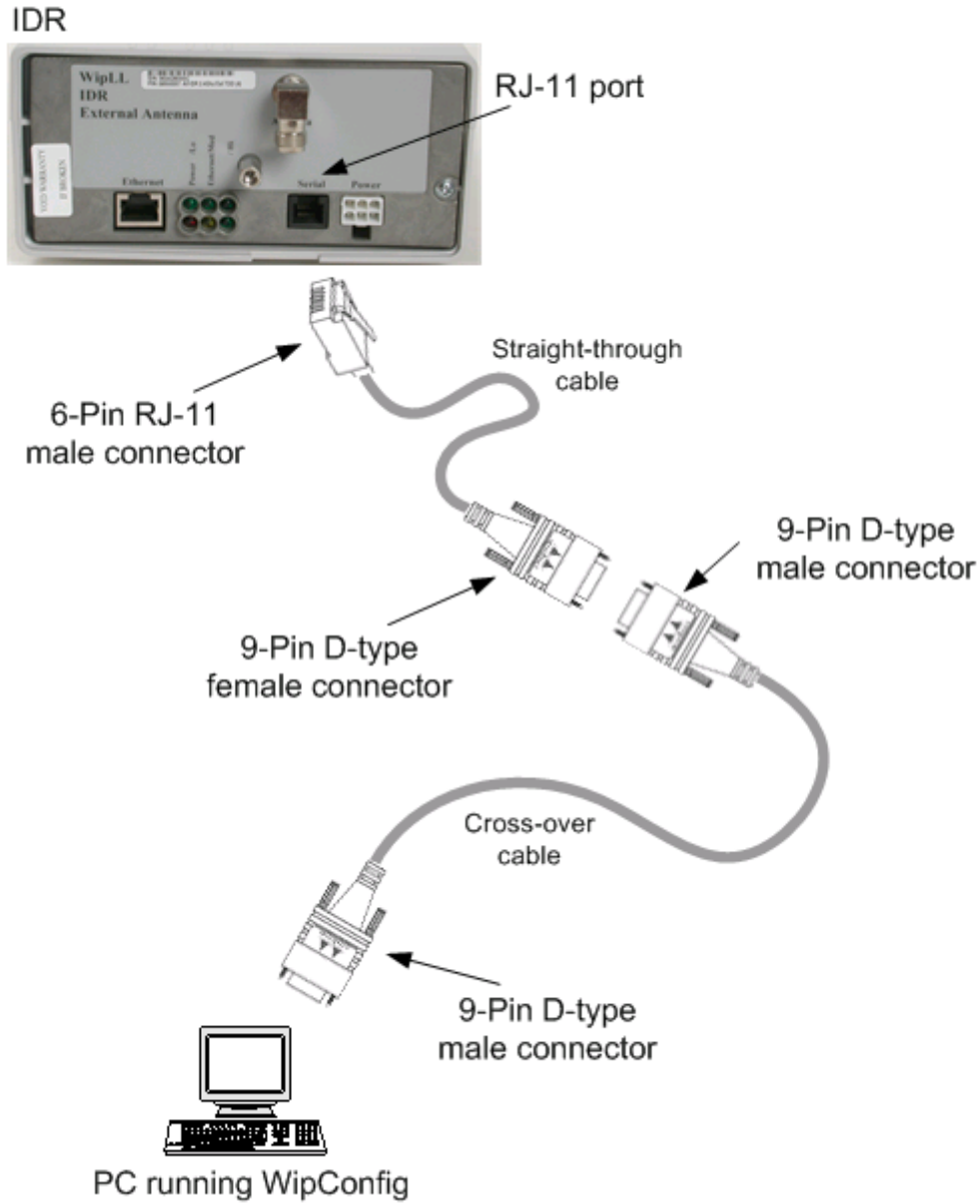
Figure 10-12: IDR-to-PC Serial Cable Connections

10.4.2. Configuring the SPR using WipConfig

When you connect the IDR to a PC, the configuration screen shown in Figure 10-13 is displayed. The parameters will be those read from the target device. (Data source: TARGET).

To change parameters type the new values into the fields ensuring that the old data is overwritten. An asterisk (*) will appear to indicate that the changes were not set and saved. Use the **Write** button to set the changes to the target device then reset the target to activate the changes.
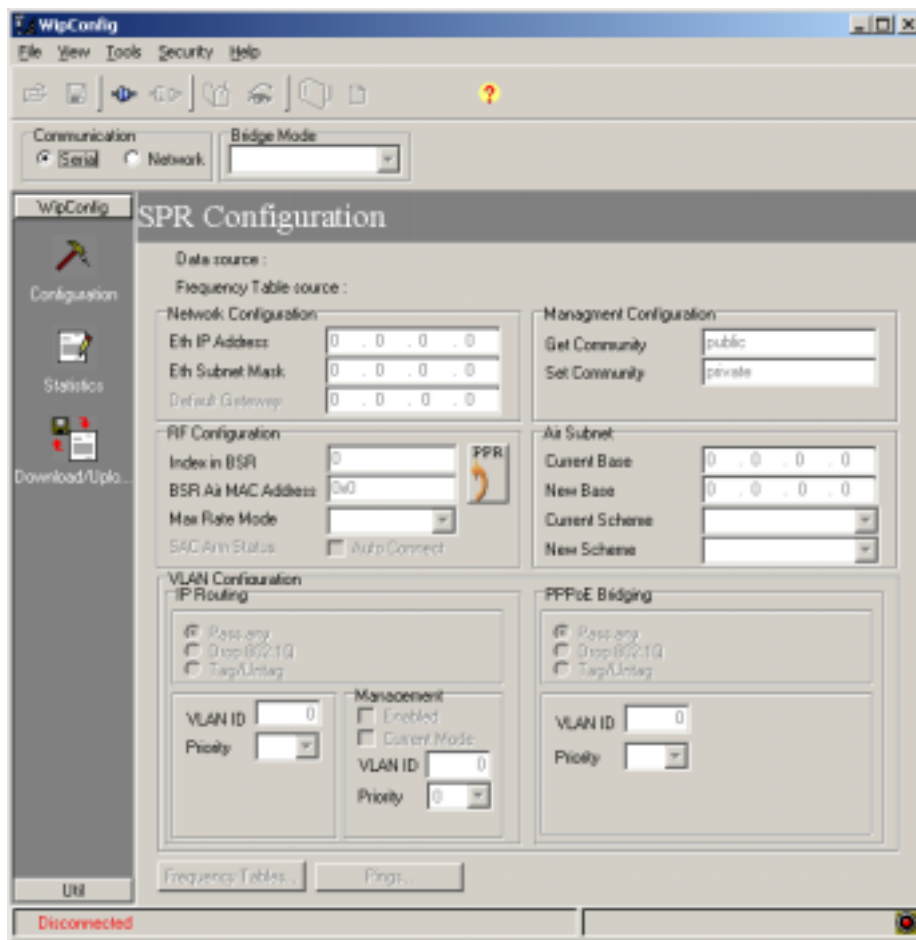
Figure 10-13: IDR initial configuration using WipConfig

The following SPR Configuration screen descriptions give brief details of each parameter:

- **Eth IP Address** - Displays the IP address of the target devices.

- **Eth Subnet Mask** - Displays the value of the subnet mask associated with the Eth IP address.

- **Get Community** - This is the GET Community string. Default value = public.

- **Set Community** - This is the SET Community string. Default value = private.

- **Index in BSR** - The unique identity of this IDR within the BSR.Valid range = 2 - 127

- **BSR Air MAC Address** – The air identity of the IDR associated BSR.

- **Max Rate Mode** – The transmission speed setting

- **Air Subnet Addresses and Schemes** – The addresses and schemes of the air subnets can be updated.

- **Frequency Tables** button – This is enabled only when using an IP (Network) connection.

Glossary

AC	Alternating Current
A/F	Across flats measurement
BNC	Bayonet Neill Concelman (Connector type)
BSDU	Base Station Distribution Unit
BSI	Base Station Interface
BSPS	Base Station Power System
BSR	Base Station Radio
CEP	Common Earth Point
DMM	Digital Multimeter
DC	Direct Current
DP	Double Pole
DCC	Direct Serial Cable Connection
GPS	Global Positioning Satellite
HSP	Hop Synchronisation Process
HSPP	Hop Synchronisation Process Pulse
IDR	Indoor Radio
IEC	International Electrotechnical Commission
IEE	institute of Electrical Engineers
IP	Internet Protocol
LED	Light Emitting Diode
mA	Milliamperes
MCB	Miniature Circuit Breaker

Mbps	Mega Bits Per Second
Nm	Newton-metres
NMS	Network Management System
NOC	Network Operations Centre
PSTN	Public Switched Telephone Network
RJ	Registered Jack (modular connector)
RFI	Radio Frequency Interference
SDA	Subscriber Data Adaptor
SME	Small and Medium Enterprises
SOHO	Small Office/Home Office
SPR	Subscriber Premises Radio
UPS	Un-interrupted Power Supply
UPVC	Unplasticized Poly-Vinyl Chloride
WAN	Wide Area Network
WipLL	Wireless internet protocol -Local Loop

Cable Crimping

This chapter describes the procedure for crimping cables for 15-Pin D-type and N-type connectors that are used in BSR/SPR-to-BSDU/SDA and BSR-to-GPS connections, respectively. The opposite ends of these cables are un-terminated, thereby providing length flexibility for connecting these WipLL units.

Crimping procedures are described for the following cable-connector terminations:

- **CAT-5e/15-Pin D-type** cable/connector terminations for SPR-to-SDA connections

- **Multipair Overall Shielded (22 AWG)/N-type** cable/connector terminations for GPS antenna connections.

- **GPS antenna connector**

> **Warning:** Correct crimping of network cables is crucial for ensuring service integrity.

B.1. Crimping CAT-5e/15-Pin D-Type Cable Connectors

This section describes the cable stripping and crimping of CAT-5e cables for 15-Pin D-type connectors used for BSR/SPR-to-BSDU/SDA connections.

Airspan recommends the "ITT Canon DB15" (code number 'DAW15P') sub-miniature type. This connector is an Insulation Displacement Connector (IDC) which crimps and secures the cable at the connection point.

Airspan recommends the following tools for stripping and crimping for 15-Pin D-type connectors:

- **Crimping tool**—hand-crimper code DW115394-1. The crimper is a cyclic crimper and will not release the cable until a full termination cycle has been completed. The tool automatically indexes to the next pin on completion of the terminating cycle.(See Figure B-1.)
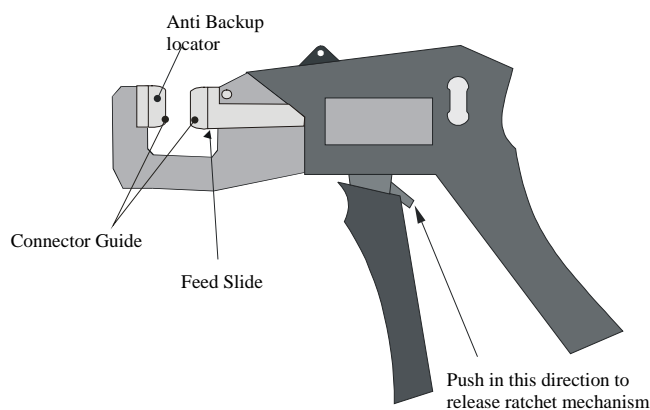
Figure B-1: Hand-Crimping Tool for 15-Pin D-Type Connector

The major features of the crimper are described in the following table:

Tool feature	Function
Terminating Head	Guides and supports the connector.
Wire Inserter	• Cuts wire to be terminated. • Forces conductors into 2 slotted beams of the contact.
Anti-backup locator	Prevents connector from moving out of position for accurate termination.
Feed Slide	Automatically advances the connector after each termination.
Adjuster	Provides wire insertion depth adjustment
Cam handle	Activates the termination mechanism inside the head.
Ratchet Pawl	Releases the cam handle before it is fully closed should a problem occur during termination operation.

■ **Stripping tool**—three-way stripping tool—*1PAC10349AKM* (see Figure B-2)
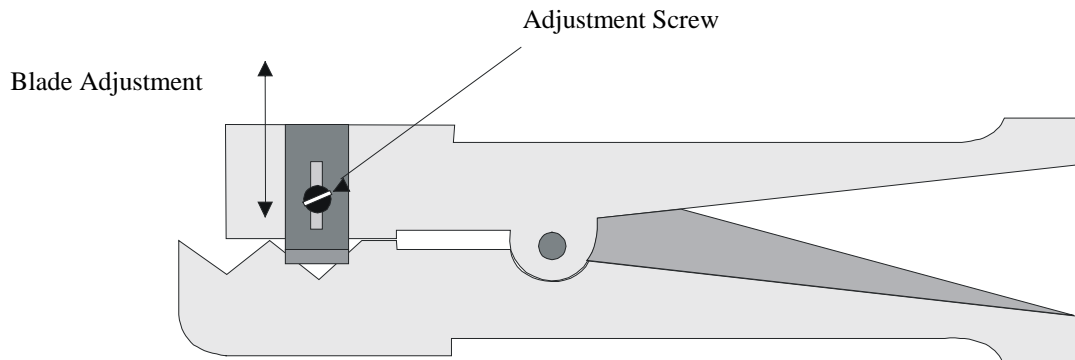
Figure B-2: Stripping Tool 1PAC10349 AKM

Cable crimping is performed in two stages:

1. Stripping the cable

2. Crimping the cable

B.1.1. Stripping the Cable

Before crimping the cables, you need to strip 50 mm of the cable.

Before using the tool, ensure that the tool is correctly adjusted. Correct adjustment is obtained when the blade cuts the outer insulation without damage to the insulation of inner conductors.

To strip the cable:

1. Cut the cable to length using cable shears (Airspan code 1PAC10333AKJ).

2. Strip 50 mm of the sheathing using stripping tool.

3. Insert the cable in the jaws of the cutting tool by squeezing the handles together.

4. Rotate 10 times, release the tool, and remove the cable and insulation.

5. Use a steel rule (1PAC10042AAV) to verify the stripped dimension.

6. Inspect the cut for evidence of damage, i.e. has the braid been cut? If so cut off cable and reset tool.

B.1.2. Crimping the Cable

Once you have stripped 50 mm of the cable, you can begin crimping the cable to the 15-Pin D-type connector.

Note: For 15-Pin D-type connector pinouts, see the relevant chapter on the specific WipLL equipment.

To crimp the cable:

1. Insert the 15-Pin D-type connector into the left slot of the crimper until the desired connector pin position aligns with the slot.

2. Insert the wire into the left side of the crimper slot until the end enters the hole.

3. Adjust the desired length of the wire.

4. Centre the wire in the slot.

5. Squeeze the crimper handles until the wire inserter bottoms out.

6. Release the crimper handles—the inserter retracts and the connector advances to the next pin position.

7. Repeat the above until all pin contacts of the row have been terminated.

Wire Slot

Connector advances in
this direction
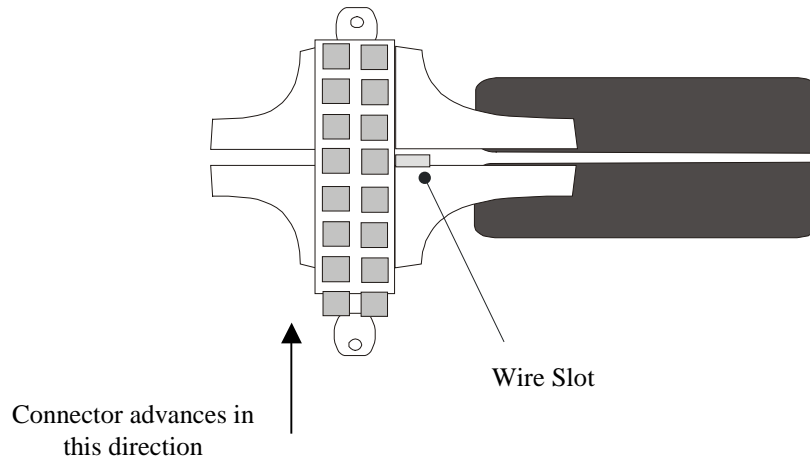
Figure B-3: Crimping tool

8. When finished, remove the connector from the right side of connector slot.

> **Note:** The connector must be inserted into the crimper from the left hand side only.
>
> Should the connector jam in the terminating position, excessive force must not be used: the spigot between the tool handles should be used to release the ratchet mechanism.
>
> The crimper handle will not allow release until a full termination cycle of the connector has been completed.

B.1.3. Inspecting the Crimped Connector

Each crimped connector is to be tested that it has been correctly crimped:

■ Ensure that the wire extends beyond the front pin contact slot by a minimum of 0.5 mm

■ Ensure that the two legs of the insulation crimp barrel are closed to secure the insulation of the wire

Note: The purpose of the barrel is to prevent the wire from being lifted from the contact. It is not necessary to have the barrel wrapped tightly around the insulation.

■ Ensure that the contact cavity has not been deformed

■ Confirm integrity by holding the connector in one hand and pulling lightly on the cable.

Figure B-4 shows points to be observed during quality inspection.

Correct Termination

0.5mm Min

Acceptable Termination

Wire was not fully inserted before termination
(or was slightly drawn back during termination)

Incorrect setting of tool
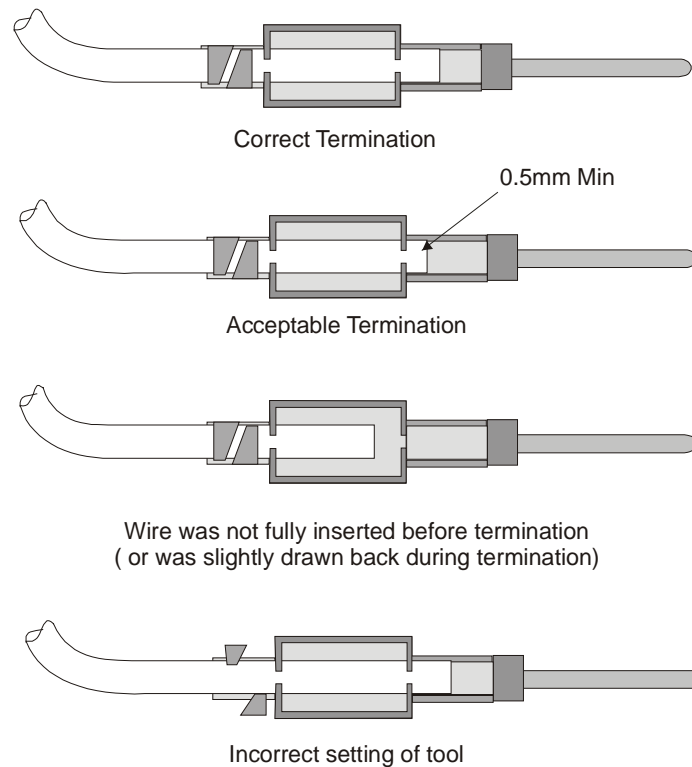
Figure B-4: Crimp Connector Inspection

B.1.4. Housing the Connector

For outdoor cable installations, the connector is to be protected in a waterproof housing assembly as shown in Figure B-5.

Note: The housing, cable seal, and clamping nut are to be slid onto the cable prior to crimping the connector in place.

To assemble the connector in a waterproof housing:

1. Insert the connector into the waterproof housing ensuring that a "click" is heard.

2. Screw the cable seal into place ensuring that the cable outer sheath is inside the connector body.

3. Secure the cable in place with the lock nut.

Sealing Ring

Connector Housing

Securing Screws

Cable Seal

Clamping Nut
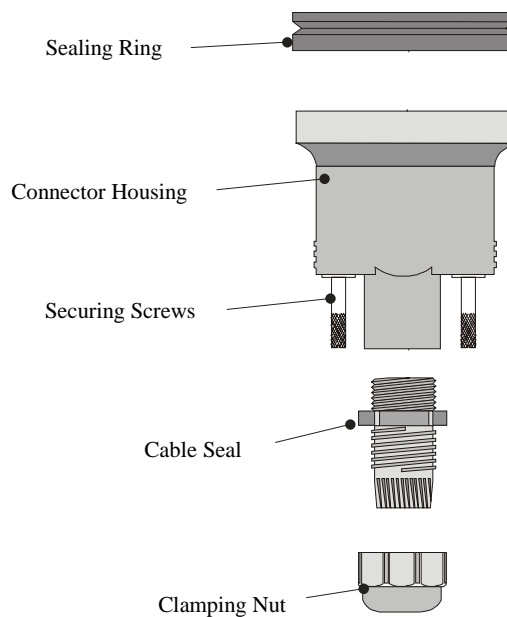
Figure B-5: Waterproof Connector housing assembly

For indoor cabling applications it is not necessary to use a waterproof housing for the connector.

To assemble the un-housed connector:

1. Insert the connector terminal block into the connector body.

2. Secure the cable onto the connector body using the cable clamp. Ensure that the cable outer sheath is within the connector body.

3. Snap the top section of the connector body into place.

4. Ensure that the connector is secure within the housing by applying a light pull on the cable.

B.2. Crimping N-type Connectors

This section describes the cable stripping and crimping **Multipair Overall Shielded (22 AWG)** cables for **N-type** connectors used for BSR/SPR connections to external antennas.

Airspan recommends using the following tools for crimping of N-type connectors:

■ **Crimp tool**: Erma 29020 with die set 29207.

■ **Stripping tool**: Maxi Corex, fitted with the 9.0 to 11.5mm cable clamp (blue) and the 9.5 to 3.2 blade cassette (green).

B.2.1. Stripping the Cable

To strip the cable:

1. The first cut should be set to cut through the outer sheath, braid and dielectric. Scoring of the centre conductor should not occur.

2. The second cut should be set to cut through the outer sheath and the braid. Important attention must be paid to the dielectric where it meets the braid. It is preferable that no cutting of the dielectric takes place, however, because of the construction of cables and tolerance build up there may be occasion where a slight cutting of the dielectric is unavoidable. This must be kept to an absolute minimum. This has been termed the compromise cut and is acceptable practice.

3. The final cut should be set to cut through the outer sheath only. Scoring of the braid should not occur.

4. All sections of the stripped Ethernet cable should be easily removed if the blade settings are correct. To adjust the blade settings use the allen key provided and apply it to the grub screws at the back of the stripping tool. Clockwise will increase blade depth, anti-clockwise will reduce blade depth.

5. Set stripping tool slide mechanism to 5.

6. Place the cable into the stripping tool with approximately 12 mm protruding from the end of the tool.

7. Clamp the tool around the cable and lock in position.

8. Holding the cable in the left hand and stripping tool in the right hand (index finger through finger hole) rotate tool in a clockwise direction for 10 turns.

9. Move slide mechanism to number 3.

10. Rotate tool in a clockwise direction for 10 turns.

11. Move slide mechanism to number 1.

12. Rotate tool in a clockwise direction for 10 turns.

13. Unlock the tool to remove cable then lock shut. Always keep the stripping tool locked shut when not in use. Take care when handling the blade insert.

14. Twist off stripped cable sections.

B.2.2. Assembling the Connector

Once you have stripped the cable, you can house the cable:

To house the cable:

1. Fit an insulating boot if required, over the cable, cutting enough of the pointed end to enable the cable to go through the resulting hole with a fairly tight grip. Push ferrule over the stripped section of cable.

2. Rotate the centre conductor in relation to the cable to splay the braid and any foil from the dielectric, which will allow the later correct fitting of the connector body (over the dielectric). See Figure B-6.Take care not to damage the braid.
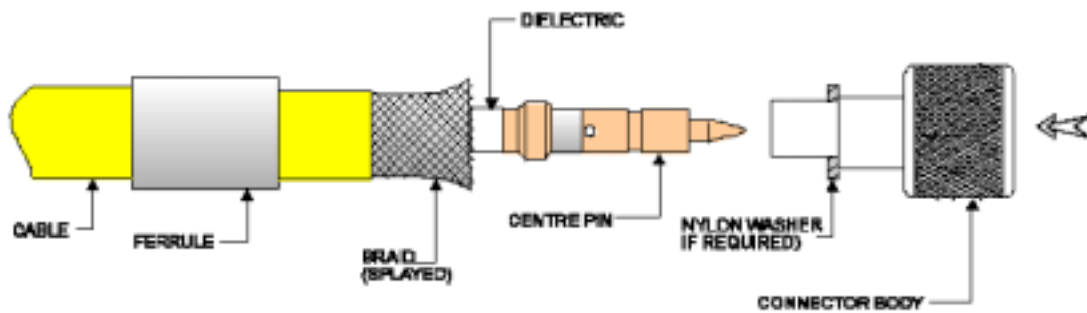
Figure B-6: Rotating conductor

3. Trim the centre conductor back to 5.5 mm from the end of the dielectric. Use the cable shears provided and not the side cutters.

4. Fit centre pin on to the centre conductor. The centre conductor should be seen through the inspection hole (see Figure B-7). Ensure that the shoulder of the pin is butted up to the cable's dielectric.
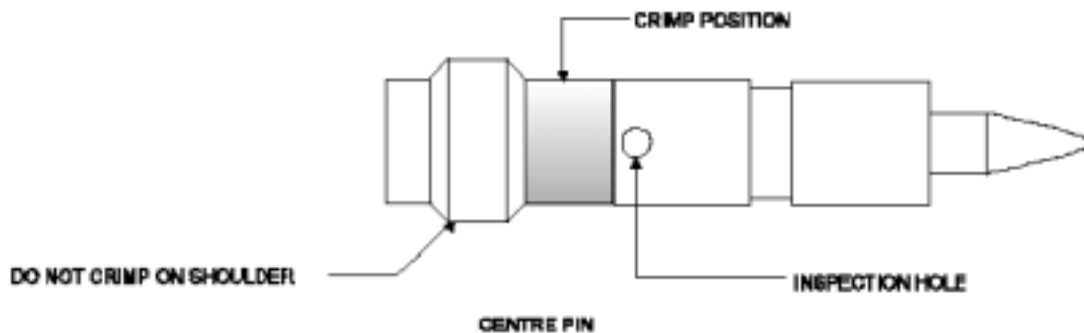
Figure B-7: Fitting center pin onto center conductor

B.2.3. Crimping

To crimp the GPS connector:

1. Using an Erma tool and 29207 die, small aperture, crimp centre pin to centre conductor. The crimp section should be just be below the inspection hole (see Figure B-7). Do not crimp the shouldered section as it will cause flashing.

2. Fit the connector body over the centre pin and between the braid and dielectric (see Figure B-6). Do not trap any of the braid between the dielectric and back face of the connector body. If the connector is supplied with a nylon washer, fit this to the rear of the connector before application to the cable.

3. Push the connector body firmly home. The centre pin should align with the end of the internal diameter of the connector body.

4. Push the ferrule up to the end of the cable, covering the braid. There should be no braid showing between the end of the ferrule and the connector body. Rotating the ferrule may rectify this, if not trim the braid slightly to suit.

5. Crimp the ferrule using the large aperture of the 29207 die. When offering up the tool the die should be positioned so as it aligns with the braid and not the outer sheath of the cable.

6. Connectors with nylon washers, the crimp is to be made with the dies held firmly against the washers face.

B.3. Crimping GPS Cable Connectors

Airspan recommends the following tools for crimping for N-type connectors:

■ **Crimping tool**—*Daniels AFM8* (M22520/2-01).
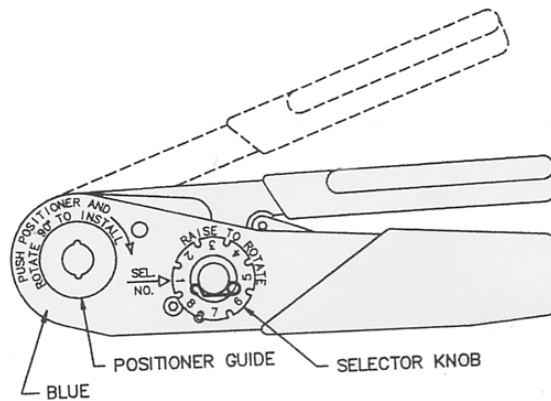
Figure B-8: Crimping tool – Daniels AFM8

Once you have housed the stripped cable, you can now crimp the cable to an N-type connector.

Note: The crimper cannot be opened without completing the cycle.

To crimp the cable:

1. Ensure that the crimper is in the open position.

2. Remove safety clip from positioner guide.

3. Select the Positioner for contact to be crimped.

4. Insert the Positioner into the positioner guide and turn it 90 degrees until bayonet pins lock.

5. Raise and rotate the Selector knob until the number indicated on data plate for cable size to be crimped is in line with **Sel. No.** arrow.

6. Insert the contact and prepared cable into the indenter opening from the side opposite the Positioner.

7. Squeeze crimper handles together until the ratchet releases. The handle will return to the open position.

8. Remove crimped contact and cable.

Technical Specifications

This appendix lists the technical specifications for the following WipLL units:

- WipLL Base Station equipment:

    - Base Station Radio (BSR)

    - Point-to-Point Radio (PPR)

    - Base Station Distribution Unit (BSDU)

    - Base Station Power Supply (BSPS)

    - GPS antenna

- WipLL Customer premises equipment:

    - Subscriber Premises Radio (SPR)

    - Subscriber Data Adapter (SDA)

        – SDA-1

        – SDA-4H

        – SDA-4S models

    - Indoor Data Radio (IDR)

C.1. Base Station WipLL Equipment

The following sub-sections list the specifications of the following WipLL Base Station equipment:

■ Base Station Radio (BSR)

■ Point-to-Point Radio (PPR)

■ Base Station Distribution Unit (BSDU)

■ Base Station Power Supply (BSPS)

C.1.1. Base Station Radio (BSR)

Table C-1: BSR and MAC Specifications

Parameter	Value	Comment
Operating frequency range	• 2.4 GHz • 3.x GHz, MMDS, 2.8 GHz • 5.8 GHz	• ISM band • Licensed band • Licensed band *Other ranges available for trial
Spectrum spreading method	Frequency hopping	Per ETSI EN301 253
Duplex method	• Time Division Duplex (TDD) - 2.4 GHz, 2.8 GHz, 3.x GHz, MMDS, and 5.8 GHz • Frequency Division Duplex (FDD) - 3.x GHz	
Transmit bit rates	Up to 4 Mbps	BER and distance dependent
Channel spacing	1 MHz	
Output power from the BSR	Up to 27 dBm, configurable at 2.4 GHz	Depending on local regulations, maximum output power can be configured at the factory
Modulation method	8-level CPFSK	

Parameter	Value	Comment
Channel access method	PPMA / Adaptive TDMA	
Protocol efficiency	Up to 80%	For large data packets
Number of SPR/IDR per BSR	Up to 126	

Table C-2: BSR EMC and Radio Standards Compliance

Parameter	Value
Radio Standards Compliance	• ETSI EN 300 328-1 • ETSI EN 301 253 • FCC part 15 • RSS139 • Telec
EMC	• ETSI ETS 300 826 • ETSI EN 300 385 • ETSI EN 300 386-2 • ETSI ETS 300 132-2 • FCC part 15

Table C-3: BSR Agency Certification

Parameter	Value
Emissions / Immunity	EN 300 339 EN 300 386-2 ETS 300 328
Safety	EN / IEC 60950
Environmental	ETS 300 019-2-x

Table C-4: BSR Network Specifications

Parameter	Value	Comment
Filtering Rate	10,500 frames/sec	At 64 byte packets
Forwarding Rate	1,300 frames/sec	At 64 byte packets
Routing table length	200 networks, including subnets	

Table C-5: BSR Power Requirements

Parameter	Value	Comment
Voltage • Minimum: • Maximum:	48 VDC nominal • 30 VDC • 55 VDC	Voltage is received from the BSDU
Maximum Amperes:	500 mA	

Table C-6: BSR Environmental Conditions

Parameter	Value	Comment
Operating temperature of outdoor units (BSR and SPR)	-30ºC to +60ºC	Optional range of -40ºC to +70ºC
Storage temperature	-40ºC to +80ºC	

Table C-7: BSR Network Interface

Parameter	Value	Comment
Ethernet Network	UTP EIA/TIA	Category 5
Standards Compliance	ANSI/IEEE 802.3 and ISO/IEC 8802-3 10Base-T compliant	
Serial Port	RS-232	

Table C-8: BSR Physical Dimensions

Parameter	Value	Comment
Height	400 mm	Excluding mounting kit
Width	317 mm	
Depth	65.5 mm	
Weight	4.7 kg	

C.1.2. Point-to-Point Radio (PPR)

Table C-9: PPR Radio Specifications

Parameter	Value
Operating frequency bands	• 2,400 to 2,500 MHz • 3,400 to 3,800 MHz • 5,725 to 5,875 MHz
Duplex method	• Time Division Duplex (TDD) for all bands • Frequency Division Duplex (FDD) for 3.4 to 3.8 GHz
Radio Technology	FH-CDMA
Multiple Access Method	PPMA
Output power	27 dBm
Antenna type (built-in) • PPR • SPR	 • 18 / 16 / 15 dBi • 18 / 16 / 15 dBi
Sub-Channel Spacing	1 MHz
Modulation	Multilevel (2, 4, or 8) CPFSK
Receiver Sensitivity (BER 1E-6 at 2/4/8 FSK)	-90/ -83/ -75 dBm
Throughput	Up to 4 Mbps per PPR-SPR link
Radio Standards Compliance	• ETSI EN 300 328-1 • ETSI EN 301 253 • FCC part 15 • RSS139 • Telec
EMC	• ETSI ETS 300 826 • ETSI EN 300 385 • ETSI EN 300 386-2 • ETSI ETS 300 132-2 • FCC part 15

C.1.3. Base Station Distribution Unit (BSDU)

Table C-10: BSDU Network Specifications

Parameter	Value
Filtering Rate	105,000 Frames / sec
Forwarding Rate	62,500 Frames / sec

Table C-11: BSDU Power Requirements

Parameter	Value
Voltage	48VDC nominal
Power consumption	Maximum 300W (including the feeding of $6 \times$ BSRs)

Table C-12: BSDU Environmental Conditions

Parameter	Value
Operating Temperature	0ºC to +50ºC
Storage Temperature	-40ºC to +80ºC

Table C-13: BSDU Network Interface

Parameter	Value	Comment
Ethernet Network	100/10Base-T: UTP EIA/TIA	Category 5
Standards Compliance	ANSI/IEEE 802.3, ISO/IEC 8802-3 10/100 Base-T compliant	
Serial Port	RS-232	

Table C-14: BSDU Physical Dimensions

Parameter	Value
Height	4.32 cm
Width	48.26 cm
Depth	22.86 cm
Weight	2.9 kg

C.1.4. Base Station Power Supply (BSPS)

Table C-15: BSPS Rectifier Specifications

	Parameter	Value
Input	Voltage	90VAC to 270VAC
	Current (nominal)	3.2A @ 230V / 4.3A @ 115V
	Frequency	47Hz to 63Hz
	Power factor (nominal line/load)	Greater or equal to 0.993
Output	Voltage (default)	53.5VDC
	Regulation (line & load)	±0.4%
	Adjustable range	47 to 58 VDC
	Current	12A @ 54V
	Ripple & noise	50mVp-p
	Efficiency (nominal load)	85% @ 230V / 82% @ 115V
	Overload current	<12A
	Over-voltage protection	60 VDC
	Over-temperature protection (measured on case, upper panel corner)	• 80±5°C rectifier stops • 72±5°C rectifier recovers
	Walk-in time	< 0.5 sec
	Hold-up time	40 ms
General	Withstand voltage (1 min)	• 4230VDC INPUT/OUTPUT • 2120VDC INPUT/GND • 1700VDC OUTPUT/GND
	Working temperature	-10 to 45°C
	Storage temperature	-50 to 80°C
	Dimensions (mm)	235 x 150 x 50 (L x W x H)
	Weight	1100g
	EMC	Refer to system specifications
	Safety	According to: IEC950

Table C-16: BSPS DC Distribution Specifications

	Parameter	Value
Input	Voltage	90VAC to 270VAC
	Current (at full load) N =Number of rectifier modules	• N*3.2A @ 230V • N*4.3A @ 115V
	Frequency	47 Hz to 63 Hz
	Power factor (at full load)	Greater or equal to 0.993
	Voltage (programmable)	42 to 60VDC ± 0.5VDC
Output	Default float and boost voltage	54 and 57VDC respectively
	Regulation (line, load, sharing)	±1%
	Current	N*12A (48A max.)
	Psophometric noise	-52 dBm (over 600 &)
	Ripple & noise	50mVp-p
	Efficiency (nominal load)	85% @ 230V / 82% @ 115V
	Overload current	< N*12A
	Over-voltage protection	60VDC
	Walk-in time	< 1 sec
	Hold-up time	40 ms
	Output current indication	10 LED's bar-graph
	Active current sharing	±10% accuracy at full load
	Withstand voltage (1 min)	2120VDC INPUT/GND
General	Working temperature	-10 ¸ 45°C
	Storage temperature	-50 ¸ 80°C
	Dimensions (19" X 3U)	Depth is 320mm W/O terminals, 360mm with terminals
	Weight	13 kg (main unit + 3 rectifiers)
	RS232 Communication	9600 bps, no-parity, 1 stop-bit

Parameter		Value
	EMC	According to: • EN300-386-2 SUB 7.2.3 • EN55022 class B • IEC1000-4-2 • IEC1000-4-3 • IEC1000-4-4 • IEC1000-4-5 • IEC1000-4-6 • IEC1000-4-11 • IEC1000-3-2 • IEC1000-3-3
	Safety	According to: IEC950
	Maximum current withstand	2x70A
LVLD (optional)	Trip voltage level	Disconnect default: 43± 0.5 VDC, user programmable Re-connect: with AC recovery

C.1.5. GPS antenna

Table C-17: SPR Power Requirements

Parameter	Value	Comment
Voltage Input	36 VDC	Supplied by WipLL's BSDU
Consumption	1.8W	

Table C-18: Environmental Considerations

Parameter	Value	Comment
Operating temperature	-30ºC to +75ºC	

Table C-19: GPS General

Parameter	Value	Comment
Input	DGPS (Differential GPS)	
Output	1 pulse per second	
Standards Compliance	MIL-STD 810E	
Interface standard	RS-422	

Table C-20: GPS Dimensions

Parameter	Value	Comment
Diameter	115 mm	
Height	90 mm	

C.2. Customer Premises WipLL Equipment

The following sub-sections list the specifications of the following WipLL CPE equipment:

- Subscriber Premises Radio (SPR)

- Subscriber Data Adapter (SDA)

- Indoor Data Radio (IDR)

C.2.1. Subscriber Premises Radio (SPR)

Table C-21: SPR and MAC Specifications

Parameter	Value	Comment
Operating frequency	• 2.4 GHz • 3.x GHz, 2.8 GHz, MMDS • 5.8 GHz	• ISM band • Licensed band • Unlicensed band
Spectrum spreading method	Frequency hopping	Per ETSI EN 301 253
Duplexing Method	• Time Division Duplex (TDD) 2.4 GHz, 2.8 GHz, MMDS, 3.x GHz, and 5.8 GHz • Frequency Division Duplex (FDD) 3.x GHz	
Transmit Bit Rates	Up to 4 Mbps	BER and distance dependent
Channel spacing	1 MHz	
Output power from the radio	Up to 27 dBm, configurable at 2.4 GHz	Depending on local regulations. Maximum power output can be set at the factory.
Modulation method	8 level CPFSK	
Channel access method	PPMA / Adaptive TDMA	
Protocol efficiency	Up to 80%	For large data packets

Table C-22: SPR EMC and Radio Standards Compliance

Parameter	Value
Radio Standards Compliance	• ETSI EN 300 328-1 • ETSI EN 301 253 • FCC part 15 • RSS139 • Telec
EMC	• ETSI ETS 300 826 • ETSI EN 300 385 • ETSI EN 300 386-2 • ETSI ETS 300 132-2 • FCC part 15

Table C-23: SPR Agency Certification

Parameter	Value	Comment
Emissions / Immunity	EN 300 339, EN 300 386-2, ETS 300 328	
Safety	EN/IEC 60950	
Environmental	ETS 300 019-2-x	

Table C-24: SPR Network Specifications

Parameter	Value	Comment
Filtering rate	10,500 frames / sec	At 64 bytes
Forwarding rate	1,300 frames / sec	At 64 bytes
Routing table length	16	

Table C-25: SPR Power Requirements

Parameter	Value	Comment
• Voltage • Minimum • Maximum	• 48 VDC nominal • 30 VDC • 55 VDC	Power supplied from the SDA
Consumption	Maximum	500 mA

Table C-26: Environmental Considerations

Parameter	Value
Operating temperature	-30ºC to +60ºC
Storage temperature	-40ºC to +80ºC

Table C-27: Network Interface

Parameter	Value	Comment
Ethernet Network	UTP EIA / TIA	Category 5
Standards Compliance	ANSI/IEEE 802.3 and ISO/IEC 8802-3; 10BaseT compliant	
Serial Port	RS-232	

Table C-28: SPR Physical Dimensions (w/o High Gain Antenna)

Parameter	Value	Comment
Height	311 mm (12.24 inches)	Excluding mounting kit
Width	244 mm (9.6 inches)	
Depth	65.5 mm (2.57 inches)	
Weight	2.5 kg	

Table C-29: SPR Physical Dimensions (with High Gain Antenna)

Parameter	Value	Comment
Height	400 mm (15.74 inches)	Excluding mounting kit
Width	317 mm (12.48 inches)	
Depth	65.5 mm (2.57 inches)	
Weight	4.7 kg	

Note: The SPR cable and connector are the same as the BSR.

C.2.2. Subscriber Data Adapter (SDA)

C.2.2.1. SDA-1

Table C-30: SDA-1 Physical Dimensions

Parameter	Value
Height	200 mm
Width	150 mm
Depth	40 mm
Weight	47 kg

Table C-31: SDA Power Requirements

Parameter	Value
Output Voltage	-48VDC nominal
Power supply	110-240 VAC, 50/60Hz, 0.3-0.7A

Table C-32: SDA-1 Environmental Considerations

Parameter	Value
Operating temperature	0ºC to +50ºC

Table C-33: SDA-1 Network Interfaces

Parameter	Value
Data from SPR/BSR	DB15
Ethernet	RJ45 socket for a PC interface
Power	AC power connector

C.2.2.2. SDA-4H

Table C-34: SDA-4-H Physical Dimensions

Parameter	Value
Height	200mm
Width	150mm
Depth	40mm
Weight	53 kg

Table C-35: SDA-4H Power Requirements

Parameter	Value
Output Voltage	-48VDC nominal
Power supply	110-240 VAC, 50/60Hz, 0.3-0.7A

Table C-36: SDA-4H Environmental Considerations

Parameter	Value
Operating temperature	0ºC to +50ºC

Table C-37: SDA-4H Network Interfaces

Parameter	Value
Data from SPR/BSR	DB15
Ethernet	Three RJ45 socket for a PC interface; one RJ-45 for cross over connection
Power	AC power connector

C.2.2.3. SDA-4S Models

Table C-38: SDA-4S Physical Dimensions

Parameter	Value
Height	200 mm (7.87 inches)
Width	150 mm (5.9 inches)
Depth	40 mm (1.57 inches)
Weight	53 kg

Table C-39: SDA-4S Power Requirements

Parameter	Value
Output Voltage	-48VDC nominal
Power supply	110-240 VAC, 50/60 Hz, 0.3-0.7A

Table C-40: SDA-4S Environmental Considerations

Parameter	Value
Operating temperature	0ºC to +50ºC

Table C-41: SDA-4S Network Interfaces

Parameter	Value
Data from SPR/BSR	15-pin D-type
Ethernet	Four 8-pin RJ-45 10/100BaseT sockets for PC interface. These ports support 10/100 Mbps Autosensing (Autonegotiation), and MDI/MDI-X automatic crossover
Power	AC power connector

C.2.3. Indoor Data Radio (IDR)

Table C-42: IDR Radio and MAC Specifications

Parameter	Value	Comment
Operating frequency	• 2.4 GHz • 3.45 GHz • 3.5 GHz	
Spectrum spreading method	Frequency hopping	(Per ETSI ETS 300 328) ARIB-STD-T66
Duplex Method	• Time Division Duplex (TDD) at 2.4 GHz • Frequency Division Duplex (FDD) at 3.5 GHz and 3.45 GHz	
Transmit Bit Rates	Up to 4 Mbps	Depending on BER
Channel spacing	1 MHz	
Output power from the radio	Up to 27 dBm, configurable at 2.4 GHz	Depending on local regulations. Maximum power output can be set at the factory.
Channel access method	PPMA	
Protocol efficiency	Up to 80%	At BER = 10^{-5}, depending on the application

Table C-43: IDR EMC and Radio Standards Compliance

Parameter	Value
Radio Standards Compliance	• ETSI EN 300 328-1 • ETSI EN 301 253 • FCC part 15 • RSS139 • Telec
EMC	• ETSI ETS 300 826 • ETSI EN 300 385 • ETSI EN 300 386-2 • ETSI ETS 300 132-2 • FCC part 15

Table C-44: IDR Agency Certification

Parameter	Value
Emissions / Immunity	• VCCI Class A • ARIB-STD-T66 • ETSI 300 386-2
Safety	EN/IEC 60950
Environmental	ETS 300 019-2-x

Table C-45: IDR Network Specifications

Parameter	Value	Comment
Filtering rate	10,500 frames/sec	At 64 bytes
Forwarding rate	1,300 frames/sec	At 64 bytes

Table C-46: IDR Power Requirements

Parameter	Value
External Power Supply Voltage	• Minimum: 100 VAC • Maximum: 240VAC
Operating Frequency Range	50 to 60 Hz
Maximum Power consumption	Less than 15W

Table C-47: IDR Environmental Considerations

Parameter	Value	Comment
Operating temperature	0-50ºC	
Operating Humidity	+30Cº 93%	Maximum humidity
Storage temperature	-40 – 70ºC	

Table C-48: IDR Network Interface

Parameter	Value	Comment
Ethernet Network	UTP EIA / TIA	Category 5
Standards Compliance	ANSI/IEEE 802.3 and ISO/IEC 8802-3 10Base-T compliant	
Serial Port	RJ-11	

Table C-49: IDR Physical Dimensions

Parameter	Value	Comment
Weight	1,430 g	
Dimensions (H x W x D)	• 155 mm (6.1 inches) x 233 mm (9.17 inches) x 74.5 mm (2.93 inches) • 120.5 mm (4.74 inches) x 61mm (2.4 inches) x 35 mm (1.37 inches)	• IDR with built-in antenna • IDR with an external antenna Note: Dimensions exclude the external power adapter.

Table C-8: IDR Pole Mounting Dimensions

Parameter	Value
Minimum pole diameter	35 mm (1.37 inches)
Maximum pole diameter	50 mm (1.97 inches)